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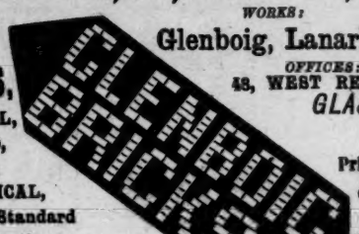

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EDITORIAL NOTES.

Comparative Results—War and Pre-War.

IN times of peace, comparative working and financial analyses in respect of periods or different undertakings are interesting and instructive, as showing the relative progress that is being made in both the manufacturing and commercial quarters, provided that, where the results apply to various concerns, those who examine the comparisons are competent, from technical knowledge and possession of information as to the individual conditions of the undertakings, to make due allowances for differences. In an unexampled time such as the present, similar comparative working and financial analyses are mainly of interest in presenting the measure of adverse effect that the prevailing conditions have had upon concerns, under their individual circumstances. This will be borne in mind when considering the analysis (by Mr. F. J. Bradfield, the Secretary of the Commercial Gas Company), which it is our pleasure to publish to-day, of the past half-year's accounts of the three Metropolitan Gas Companies and of the four principal Suburban Gas Companies. We congratulate the compiler upon the promptitude with which he has accomplished this useful piece of work, and submitted the results to our readers. Following custom, he has confined the comparisons of the past half year with those of the second half of the preceding year, so that we have two war half years contrasted; and therefore the differences as shown only illustrate the partial effect of the war upon the financial workings of the Companies, instead of the full effect which comparison with the second half of 1913 would have given. But, of course, there must be some limitation even to statistical exercises of this character; and readers can ascertain for themselves what those full effects have been by turning back to the corresponding work performed by Mr. Bradfield for the second half of 1913, and making the comparative calculations for themselves.

For example of the substantial differences made by the war, by skipping the December half of 1914 and going back to the second half of 1913, the figures as to the cost of coal and oil, less residuals, may be taken. For the past half year, the Commercial and the Wandsworth Companies are the only two of the seven that, compared with the December half of 1914, show an actual reduction per 1000 cubic feet of gas sold on the net cost of coal and oil. The net cost in the case of the Commercial Company was 7·37d., or a decrease of 0·60d.; but the figure for the 1914 half compared with the 1913 half presented an increase of 1·43d. The net cost of coal and oil per 1000 cubic feet sold last half year in the case of the Wandsworth Company was the lowest of any—viz., 6·8d., or a decrease of 1·12d.; but the 1914 half showed the small increase of 0·46d. This result must be almost unique. In the case of all the other Companies, there were substantial increases in the half year to be added to advances in the 1914 half, before ascertaining the full effect of the war conditions on the net cost of manufacturing materials, as compared with the corresponding half year immediately preceding the war. The net cost of materials last half year to the Gas Light and Coke Company was 8·60d. per 1000 cubic feet of gas sold—an increase of 0·92d. upon the second half of 1914, which half year exhibited an increase of 2·65d. upon the corresponding period of 1913. The figures for the South Metropolitan Company were: Net cost of coal last half year, 9·62d.—an increase of 3·33d. upon the increase of 1·33d. in the second half of 1914. The net cost for the Brentford Company was 10·81d.—the increase being 1·67d. upon the increase of 1·21d. in the second half of 1914. The South Suburban Company's net cost was 10·96d., or an increase of 2·2d., upon an increase of 0·70d. in the corresponding half of 1914. The Tottenham Company's net cost was 11·66d., or an increase of 2·19d., with 1·56d. advance in the December half of 1914.

If further the total expenditure (less residual products) is taken to ascertain the difference between last half year and the corresponding half preceding the war, we see better still how war conditions have told. In the case of the Commercial Company, the total expenditure (less residuals) per 1000 cubic feet of gas sold was 0·09d. less last half year; but in the second half of 1914, there was an increase of 2·42d. In the December half years of 1915 and 1914, the increases of the Gas Light and Coke Company were respectively 2·04d. and 2·4d.; of the South Metropolitan Company, 4·65d. and 0·37d.; of the Wandsworth Company, 1·44d. and 0·18d.; of the South Suburban Company, 5·57d. and 0·77d.; and of the Tottenham Company, 3·25d. and 0·46d. In the case of the Brentford Company, the increase last year was 0·35d.; but there was apparently no measurable movement one way or the other in the December half of 1914 compared with that of 1913.

Dividends are unfortunately now smaller owing to the higher price of gas; but consequent on the reduction in consumption during the December half of 1914, and the comparatively small increases then made in price, the amount paid for dividend and interest per 1000 cubic feet of gas sold showed increases in all the Companies save one, compared with the second half of 1913. The additions were: Gas Light and Coke Company, 0·28d.; South Metropolitan Gas Company, 1·41d.; Commercial Company, 0·43d.; Brentford Company, 0·08d.; Wandsworth Company, 0·49d.; Tottenham Company, 0·76d. The South Suburban Company were the exception, with a reduction of 0·23d. But last half year, due generally and principally to the higher prices of gas and further reductions of dividends, there were decreases in all cases but one, compared with the second half of 1914, in the requirement for interest and dividend per 1000 cubic feet of gas sold. The exception was Brentford, which increased by the infinitesimal amount of 0·04d. Decreases in the other cases were: Gas Light and Coke, 0·97d.; South Metropolitan Company, 0·47d.; Commercial Company, 0·90d.; Wandsworth Company, 0·25d.; South Suburban Company, 0·88d.; Tottenham Company, 0·67d.

The figures presented here illustrate, especially those referring to net costs, that the tables published this week must only be taken as making contrast between two war half years, and not as indicating the full weight of the effects of the war. This, of course, is obvious to any professional gas man. But the "JOURNAL" is, in relation to financial and commercial matters, perused by many others than professionals; and it is therefore advisable to make the point. However, the figures quoted also instance the interest that there is to be gained by exploring half year by half year Mr. Bradfield's tables of statistics, the value of which was very properly acknowledged both by the Chairman (Mr. W. G. Bradshaw) and by Mr. H. E. Jones, at the meeting of the Commercial Gas Company last Thursday.

New Coal Contracts and the Price Limitation Act.

THERE was one especially good piece of intelligence in the speech of the Chairman of the Commercial Gas Company (Mr. W. G. Bradshaw), at the meeting of the proprietors last Thursday, which will have general interest and approval, and be looked upon as of good augury. Although the Company have contracts for coal which have still some months to run, the Board have already arranged for their usual supplies for more than twelve months ahead; and—this is the point of interest—while the prices have not been fixed in all cases, the Directors have actually contracted for a substantial quantity at a price "considerably less" than the limit fixed by the Price of Coal (Limitation) Act, 1915. This is an exceedingly satisfactory announcement, and particularly so the words "considerably less."

The fact that this contract has been entered into by colliery owners of good position testifies various things. It is clear, for instance, that little reliance can be placed upon some of the reports emanating from interested parties as to the impossibility of coal now being raised and sold at prices

governed by the Price of Coal (Limitation) Act, and that recourse must be had to the provision of the Act which gives a right of appeal to the Board of Trade from the standard amount of 4s. It is apparent from the statement of Mr. Bradshaw that the colliery owners concerned in the making of this contract see no need for any appeal to the Board of Trade; on the contrary, they find themselves in a position to do some substantial prospective business at a price "considerably less" than that allowed by the Act. The announcement also indicates that there are colliery owners who do not regard the price allowed under the Act as at once a minimum and a maximum, and who are prepared to bargain for contracts on lines below the maximum. But the Commercial Company are evidently fortunate in the colliery owners with whom for years they have done business. They are reasonable; and Mr. Bradshaw frankly and fully acknowledged that they had treated the Company very well, not only before the war, but during the disturbed conditions created by it. "Our ships have been loaded "promptly, and our supplies have been well maintained." Not all the London and Suburban companies could pay a similar tribute to the whole of the colliery owners with whom they have contracts running.

However, the Commercial Gas Company are to be congratulated upon the position in which they find themselves in respect of coal contracts well ahead. That is only part of the good fortune which is attending the Company in these times when good fortune requires to be closely searched for before being discovered. With an increase of only 4d. in the price of gas, the Company have done extremely well financially; and this is largely attributable to the possession of their own colliers, which, as the figures given in Mr. Bradshaw's speech disclose, are being run to-day, despite all the additional expenses, at 10s. per ton below current market rates of freight. Another feature of the proceedings was the statement that the Company are now contemplating, under the changed circumstances of the times, extending their operations into tar distillation; and still a further one was the handsome and well-deserved compliment paid to the late Assistant Engineer of the Company (Mr. G. M. Gill) upon his selection for the distinguished position of Chief Engineer of the South Metropolitan Gas Company.

Pitch and Coal Charges.

What Mr. Thomas Glover described, in the columns of the "Journal" for Feb. 1, as the "Burden of Pitch" is a condition that is growing apace with the comparatively small outlet that the substance has, owing to the war and the enormous rates of freight. We cannot go on annually producing in the gas industry 750,000 tons, and the coke-oven industry a very considerable amount—an amount also running into hundreds of thousands of tons—with outlets almost completely closed against it, without, through the accumulations which are seriously embarrassing the tar distillers, affecting the economic position of the commodity far ahead. When the outlets are again opened, we shall still be producing on the old scale, with the great mass of accumulated stock of which to dispose. There can be only one result of this condition, unless relief can in the meantime be obtained, and that is a very long period of low values. This is being generally recognized; but the direction in which to secure relief is the question of the hour. Briquette making does not "take on" to any large extent in this country; and it is not a means of relief that can in these times be readily applied. The use of pitch for road-making has the drawback that little money is at present being spent in this direction. The most promising outlet therefore for restricting the accumulations of pitch is its use admixed with coal for gas making. If pitch to the extent of 5 per cent. of the weight of coal carbonized could be universally used, there need be no accumulation beyond that already in store up and down the country. This is a condition that is not likely to be achieved. It is, however, one of the necessities of the times that the matter shall not be lightly discarded as being a promising measure of relief, but that there should be widespread trial of it. Trials are being extensively made by the London Companies, and at gas-works in the district of the Manchester Institution of Gas Engineers; but few definite results have yet been published. Mr. Thomas Glover, as mentioned above, gave his in our issue of Feb. 1; Mr. Alex. Yuill in our "Correspondence" columns to-day details the results obtained and experiences he has had at Dundee. We emphasize his suggestion that other engineers who have made trial should publish their results.

But while some gas engineers do not find any particular benefit from utilizing pitch in the manner suggested, both Mr. Glover and Mr. Yuill are satisfied that using 5 per cent. of pitch properly (not indiscriminately) mixed with coal is a practicable and to an extent a profitable matter. But when the data presented by both experimenters are studied—those from Mr. Yuill approximately confirming those of Mr. Glover, though the pitch was without question derived from very different coals—the profitableness does not appear to be of a direct or substantial nature. The great indirect advantage appears to lie in preventing the pitch market being laid in ruins for a considerable period. Both Mr. Glover and Mr. Yuill prefer to limit the proportion of pitch to coal to 5 per cent., but for different reasons. When working up to 10 per cent. at Norwich, trouble commenced in the tops of the ascensions and through thickening of the tar in the hydraulics; while at Dundee difficulty was found through the clogging of the pusher-heads of the hydraulic machinery. However, in regard to the general results, the article by Mr. Glover as published on Feb. 1 and Mr. Yuill's letter printed to-day should be read in conjunction; and, taking the experiences together, it will be agreed that, as a measure of relief, the use of 5 per cent. of pitch could, without detriment to the main results, go on indefinitely, where the gas undertakings do their own tar distilling, or where gas-works have outside tar distillers in reasonably close proximity. The matter is worth very full consideration; for the war has made the question of pitch disposal a very large one for the gas industry.

High Efficiency from Oxide Purification.

The paper Mr. William Bennett read before the members of the Western District of the Scottish Junior Gas Association last Saturday deserves a better title than "Notes on Purification." It is constituted of the results of a detailed study of the subject at Greenock; and we can see at the back of it, the encouragement and guidance of Mr. James Macleod, F.I.C. There is one thing that is clear from this many-pointed contribution, and it is that we have not, with all the work that has been done in connection with purification, and all the publication that has been made of the issues of investigation, come to the end of the scientific interest and of the solution of all the problems that are to be found within the works' series of oxide purifier-boxes.

In part, the paper presents afresh principles that should be adopted in securing the best possible results from oxide; and that Greenock is in a position to give advice on this subject will be conceded when it is pointed out that the sulphur content of the gas supplied to the town averages 7·5 grains per 100 cubic feet. With such an efficiency as this, there is no need at Greenock to give attention to any heat or other system outside oxide purification to increase the sulphur purity of the gas. The very attempt to further remove the carbon bisulphide and sulphur compounds other than sulphuretted hydrogen would be a work of supererogation, a complication, and quite unnecessary expense. But circumstances alter cases. However, the forward rotation system is practised at Greenock, the oxide purification capacity is on liberal lines, and vertical retorts are in use; and with vertical retorts in use there is advantage from the outset in the matter of purity. The whole purification system, apart from oxide, must be worked to a high state of chemical efficiency. The low sulphur result named, Mr. Bennett says, led to the idea that some reduction of the sulphur compounds other than sulphuretted hydrogen took place in the purifiers—possibly through the absorption of carbon bisulphide by the large amount of free sulphur in the oxide. But an even lower result was achieved when, to put the theory to proof, gas was led from the inlet of the purifiers through two small purifiers containing entirely new oxide, and thus freed from sulphuretted hydrogen. The result of a test showed 9·06 grains of sulphur at the inlet of the purifiers, and 5·7 grains at the outlet of the purifiers proper. This is the result of one test only; and we hope that Mr. Bennett will pursue the matter, and try to arrive at indisputable reasons for the extraordinary purification results that the figures disclose. This result and others that have been published show that there is a good scope for still further investigation into causes and effects in connection with purification. We remember that, in his

Presidential Address to the Manchester Institution in 1914, Mr. J. G. Newbigging pointed to the curious sulphur results that he obtained with two coals; the coal with the lower sulphur content giving the larger number of grains of carbon bisulphide in the purified gas. The actual figures were: No. 1 contained 1·55 per cent. of sulphur, and gave 33·78 grains of carbon bisulphide in the purified gas; while No. 2 contained 3·02 per cent. of sulphur, and gave 23·41 grains of carbon bisulphide in the purified gas. The conclusion Mr. Newbigging drew from these paradoxical results was that the condition in which the sulphur exists in the original coal is a determining factor in influencing sulphur in the purified gas, and not its total content.

It is evident that there are other things besides a strict compliance with rules and methods, and controllable physical conditions within the purifiers, that have effect on purification results, and which go a very long way in the matter of realizing efficiency. We want to know more about these matters; and this will only be achieved by persistent progressive research. It is hoped Mr. Bennett will continue his work in this connection. The reference, too, that he makes to vertical retorts—as to temperature governing the amount of impurities, and as to the differences in the impurities when working with good top heats and when working with a fairly uniform heat through the retort—gives hope of forthcoming additional interest being supplied in this particular direction.

The points of interest in the paper are so many that useful comment cannot be directed to them all. Those who read the contribution will probably find things with which in practice they disagree, and may also be reminded of incidental points which perhaps have escaped their memory. For instance, the effect upon efficiency of ammonia pressure in liquors of various strengths and of ammonia pressure in gas is not always borne in mind. As Mr. Bennett puts it, if the ammonia pressure in the liquor is greater than the ammonia pressure in the gas, then ammonia will be given up to the gas; whereas, if the ammonia pressure in the gas is greater than the ammonia pressure in the liquor, then ammonia will be absorbed by the latter. And, again, absorption of ammonia increases with decrease of the temperature of the washing water; but the temperature should not be too low, as ethylene and benzene will be thrown out. Another thing is that nothing should be taken for granted on *primâ facie* evidence, but that chemical test should be the arbiter, as, for example, in making an actual test of oxide before finally determining that it is in a condition ready for discharging. In fact, the paper bristles with useful hints—all tending to the one desired end of high efficiency in respect of purifying performance, and reduction of the labour and expense incidental thereto.

Liverpool Gas Company.

There will be general appreciation in the gas profession over the very graceful reference made by Mr. H. Wade Deacon, the Chairman of the Liverpool Gas Company, at the meeting of the proprietors last Tuesday, to the loss of their former chief officer, Mr. Edward Allen. His characteristics as a man, his ability as an engineer, his sound judgment and advice and loyalty as an officer were placed on record; and this was all crowned and accentuated by Mr. Deacon's words: "I felt his death as the death of a friend." However, men pass, and the affairs of life continue their course. Mr. R. E. Gibson is in Mr. Allen's office, and has largely been responsible for the working of the past year, upon the foundations laid by his predecessor. Liverpool is to be congratulated upon the fact that the Company, despite unusual difficulties and the heavy costs in connection with labour and materials, as well as the additional outgoings in other directions, have been able to continue to supply gas at 2s. 1d. per 1000 feet, and have only just been compelled to raise the price to 2s. 3d. The sales of gas have increased considerably during the year; but Mr. Deacon has warned the proprietors that various causes may bring about a reduction of consumption in the near future. If so, it will only be during these war times the very common experience of the suppliers of light, heat, and power.

Freights and Government Defence.

The question of mercantile shipping is, Mr. Runciman says, constituted of a hundred problems, and not of a single one. That may be. The fundamental problem is the shortage of tonnage; and two of the primary reasons for the shortage is that such a large proportion of the tonnage has been commandeered by the Government, and that the Government have not until now made it their business to see that the execution of contracts for new vessels was made a war necessity, in view of their own large requirement. All through this war, we have been labouring under the disadvantage of a want of foresight. With the first matter, Lord Curzon's Committee are now dealing, to see whether anything can be done to economize in the matter of the ships commandeered by the Government. The allegation is that the Government commandeered much too liberally. Mr. Runciman acknowledges that (we suppose this includes torpedoed and mined vessels) there are only available for our mercantile business to-day 67 vessels out of every 100 that were available before the war, and that of the 67 from 21 to 24 are neutral vessels. Naturally, there is a reluctance on the part of the Government to admit that there is waste in connection with the large number of vessels commandeered; but various shipowners had, in the House last Thursday night, some gruesome tales to tell of wasteful use. For example, Mr. Houston stated that half the time of the 450 big ocean-going colliers requisitioned for the Fleet is wasted. No one who heard the allegations coming from men of authority in shipping could escape the feeling that certain Government Departments are not so innocent of blame in this matter as is suggested by their apologists. As to the delayed shipbuilding under pre-war contracts, it is announced that the Government have—now that the country is in a terrible plight with its shipping, and is being heavily bled by high rates of freight—decided to grant facilities for the completion of a tonnage of half-a-million. If the means of producing economy in the ships requisitioned by the Government are supplemented by a reduction of unnecessary imports and new tonnage, and if too many are adopted for the more rapid loading and discharging of vessels at the docks, some relief should be obtained.

Maximum Rates of Freight.

In the discussion in the House, Mr. Balfour stated that the present market rates of freight are preposterously and dangerously high; and Sir Walter Runciman not long since admitted that the cost of freightage was not only scandalous, but a crime. In face of these opinions, the President of the Board of Trade asserts that it is impossible to apply to British vessels maximum rates of freight. Either, he held, the rates must be put up to the world level, in which case the country would get no direct benefit, or so low as to give the country some sort of benefit, but, being so low, the 21 to 24 neutral vessels out of the 67 per cent. of vessels available now as compared with pre-war times would be driven from our ports. In other words, Mr. Runciman contends that the neutral minority compels this country to bear the burden described by Mr. Balfour as "preposterous" and "dangerous," and by Sir W. Runciman as "scandalous" and "a crime." It can hardly be asserted that the President of the Board of Trade made out a good case against maximum rates of freight. Everything he said, only goes to prove, however, that the procrastination of the Government in this matter—a matter which should have been taken in hand as a cardinal one at the beginning of the war—has only made the problem more and more complex. A better defence was made in connection with the charge that this country is largely profiting from the high rates of freights to allied countries—a matter which has been a source of grievance to, among others, British gas companies whose operations are carried on in the countries of our Allies. For instance, it was shown that of the vessels carrying coal from Cardiff to Italy in the three months ending in January, 28 were British, 39 Italian, 35 Greek, and 23 of other nationalities. From the Tyne, half the vessels going to Italy were British, and half foreign. These data, of course, remove from British shipowners the stigma of being solely responsible for the high freights to Italy. The Government have the power of regulation, and so have the French and Italian Governments. Why should they not all use it?

Dye Supplies and Dyers' Profits.

We are not as a rule interested in the financial concerns of dyers' associations or companies. But since the war started, we have heard a lot about the shortness of the supplies of dyes, and of the possible consequences of the stopping of the inflow from Germany of the requisites for the dyeing business. But the

country has been marshalling its productive forces; and the gas industry has been backing these up with the intermediate products. This is where interest hinges in matters affecting the production and uses of dyes. With all that we have heard and read, the impression has been deepening that the industries engaged in dyeing must have had a very unhappy time during 1915; but relief from this impression comes with the publication of the report of the Bradford Dyers' Association. It cannot be said that the shareholders of this organization need despair when they learn that, as the result of the trading in 1915, it has been possible to place £168,181 to repairs and renewals; and then, after making provision for income-tax, excess profits duty, and other contingencies, to show a net trading profit of £568,623, to which has to be added £125,882 brought forward. A sum of £90,000 is transferred to depreciation fund, and £10,000 to investments contingency fund; interest is met on debenture stock, dividends are paid on preference stock; and then a dividend of 7 per cent. and a bonus of 3 per cent. are to find their way to the holders of ordinary shares. After this £10,000 is carried to the employees benefit fund, £144,628 to the reserve fund, and £119,861 is carried forward. And yet by those who did not know better, there had been visions of a starving industry, and very lean (if any) profits! Our hopes rise as to being able to do largely without the assistance of the Germans in the dyeing industries after the war. The longer the war lasts, the more self-reliant we shall become; but may the war end quickly, provided it does so properly.

Zeppelin Raids and Street Lighting.

In writing on this subject in the editorial columns last week, it was remarked that it might become of military importance, and a necessity in safeguarding the inhabitants of our cities and towns, in these days of airship raids and bomb-dropping, that means should be adopted by which street gas-lamps can be extinguished and re-lighted promptly without interrupting the private supply. There are such means available; whether they are applicable in all districts, and with all existing canalization systems, is another matter. Last Tuesday—the day that our remarks on the general subject were published—a report came to hand that Rouen and Havre had had their first Zeppelin raid, or rather attempted raid. In Rouen, the electricity supply everywhere was at once cut off; but not so the gas supply. "Some squares," the report says, "where gas is used, remained brilliantly lit for half an hour, when gas men rushed round putting out the lamps." On the other hand, with the electric light, the streets were plunged in darkness, the trams were stopped, and sudden darkness was produced in theatres, shops, and elsewhere. But there was no panic. Rouen is to be congratulated on the level-headedness of its population. A sudden plunging of people in total darkness, especially where a number are gathered together, is a happening that may cause panic. With gas nothing of the kind occurred; only the street lighting was affected. The warning being sufficiently long—and good warning, with proper intelligence organization, it is not impossible for the authorities to arrange for—there was ample time before the Zeppelin was seen (and fortunately driven off) for the gas-lamps to be extinguished in a manner that produced no commotion or danger. And when there are no Zeppelins about, the report acknowledges, the squares are "brilliantly lit" by the gas-lamps.

Trading Possibilities.

If, as we are assured is the case, there will after the war be openings in Russia for practically every class of British manufactured goods, the time is none too soon now for taking in hand the necessary organized preparation for the campaign. There is, indeed, a good deal of lost ground to be made up, before any reference is made to new outlets; for the figures of imports into Russia over the last twenty years can lead one to no other conclusion than that the United Kingdom has been retrograding while Germany has progressed. In other words, Germany has been increasing her trade with Russia at the expense of this country. This is a state of affairs which should, and we hope will, be remedied in the not very distant future—though such hope does not find a great deal to sustain it in a memorandum prepared by the Acting British Consul-General at Moscow which is published in the current issue of the "Board of Trade Journal." In this, the assertion is made that unfortunately there is at present little sign in the United Kingdom of that organized preparation which alone will enable the British trader to reap the full advantage from the opportunity which the end of the war will undoubtedly give to him. Manufacturers will do well to bear in mind the clearly-expressed warning that if the United Kingdom wishes to establish her footing on the Russian market after the war, it is essential to begin to organize now on certain definite lines; otherwise the psychological moment will assuredly be lost. Organization and combination are essential. It must not be said of the future as is remarked by the Acting Consul-General of the past—that "the British trade in Russia belonged to a body of stragglers who were simply swept out of the field by a combination that was far too strong for them." Suggested methods of developing British trade are discussed in the memorandum—local representation, the group agency, commercial banking, establishment of forwarding agents, and an official visit of British merchants. The suggestions made are worthy of careful consideration; and the final sentence of the memorandum will not be overlooked—"that in almost every case when a British firm has gone to the trouble of setting up its own branch or agency in Russia, it has met with unqualified success."

Coal Handling and Carbonization.

In the paper that Mr. James Dickson read before the Scottish Junior Association (Western District) last Saturday, he proved the economy that had been achieved by the new gas-works at Kirkintilloch, and with practically all his points, there is agreement. From the engineering aspect, there can at once be concurrence and otherwise with different features in the design of the works; and on the one point which suggests criticism, there may be certain local modifying circumstances. In nowadays choosing a new site for gas-works, the old rule of placing the works at the lowest level in the district has been altogether superseded by the one of locating works where the greatest economy can be realized in the handling of material; and, complying with this rule, the site may not be at the lowest part of the district. It is so at Kirkintilloch; and economy in the handling of material has fully justified erecting the works at an altitude of about 50 feet above the level of the part of the town where the old works were situated. The point that suggests itself for criticism is the retort-house. For twelve beds of eight single retorts built back to back, a building 96 ft. 6 in. long by 150 ft. 6 in. broad appears, from the distance, to be a structural extravagance. The house has been constructed of such size that a railway runs on either side of the bench—the idea apparently being that, in addition to feeding the flanking coal-stores, the coal can be worked direct from the railway waggons into the retorts. Surely, under modern retort-house practice, a building of less magnitude would have sufficed, and yet economy in carbonization been achieved. Perhaps reasons which are not visible from a mere reading of the paper may account for the choice of this spacious house for such relatively small carbonizing requirement—the retort provision mentioned being now 140 per cent. in excess of the maximum day's make.

New Director of the Gas Light and Coke Company.

The vacancy created on the Directorate of the Gas Light and Coke Company by the recent death of Sir Hugh Owen, G.C.B., has been filled by the election of Sir Daniel Ford Goddard, M.P. for Ipswich, whose name appeared in the New Year's Honours list last month, when he was made a Privy Councillor. Sir Daniel is, of course, exceedingly well known, as he is respected, in the gas profession, with which he has had a life-long connection. For a period of fourteen years, from 1882, he occupied the position (held by his father and grandfather before him) of Engineer and Manager of the Ipswich Gas Company, of which, and of the South African Lighting Association, Limited, he is now Chairman. He is also the Deputy-Chairman of the Tottenham District Light, Heat, and Power Company. Thus he will bring to the more imposing position to which he has now been elected a ripe experience of gas administration under varied conditions. The honour of knighthood was conferred upon him in 1907.

Mr. Samuel B. Clapham (Messrs. Clapham Bros.), of Keighley whose will has been recently proved, left £14,674.

The death has occurred of Dr. C. L. H. Pemberton, who was for many years Chairman of the Banbury Gas Company—a position from which he retired a short time ago. He was eighty years of age, and the senior medical practitioner of the town.

PERSONAL.

Mr. H. HUGHES, the Manager of the Buckfastleigh Gas-Works, has been appointed Superintendent of the Devon Gas Association, and will be stationed at Moreton Hampstead. Mr. W. MADDOCK, the Manager of the South Brent Gas-Works, succeeds Mr. Hughes at Buckfastleigh.

To the names of those associated with the gas industry who have distinguished themselves on the field of battle, is added that of Rifleman B. J. PUGSLEY (17th London), who has recently been awarded the D.C.M. Prior to the outbreak of the war, he was employed as a technical draughtsman at the Luton works of the Davis Gas-Stove Company, Limited.

Caporal-Fourrier CHARLES E. DASNIERES has been mentioned at the instance of his Brigade for conspicuous gallantry during the attack of June 6 last in the fighting on the plateau of Quennevières —being the first to enter a dug-out occupied by several Germans. Caporal-Fourrier Dasnieres (who has been wounded during the war) has also received the "Croix de Guerre." In other times, as a member of the firm of V. Dasnieres, of Water Lane, E.C., he has been in the habit of calling at gas-works in this country in connection with the purchase of retort carbon.

Referring to the war, at the annual meeting of the Uxbridge Gas Company. Mr. H. E. JONES (the Chairman) said he wished he could have brought them an example of the savage methods of their enemies; their Assistant Engineer, Mr. BROUGH, who had returned, having lost one arm in battle, and the other arm as the result of murderous attacks after he was already a prisoner and wounded. They meant at some future date to do what they could to employ him. He was a standing illustration of the barbarism of the Kaiser, who kept on invoking God Almighty in every address he made to his troops. The King went to see Mr. Brough in hospital, and, knowing his pension would be a very poor one, gave him instant promotion to the rank of Captain, so that he could draw a larger pension.

Income-Tax Law.

A subject which is of more importance now than was the case some years ago, and which it is feared by many may become of even greater importance in the near future, is the law relating to income-tax. In the present time of unprecedented but absolutely necessary expenditure, while no one should wish to escape his due share of the burden of taxation, the income-tax has grown to such proportions that many people who never inquired into the law on the subject before are doing so now, in order to make sure that, under the new legislation, they do not pay more than is legally required of them. Thus it is that the ninth edition of Pratt and Redman's "Income-Tax Law" (by the late J. Tidd Pratt, Q.C., and Mr. J. Haworth Redman, of the Middle Temple, Barrister-at-Law) makes a timely appearance. The book, which is published by Messrs. Butterworth and Co., of Temple Bar, and Messrs. Shaw and Sons, of Fetter Lane, E.C., at the price of 9s. 6d. net, is an analysis of the Income-Tax Acts, with decisions, illustrations, and explanatory notes, and a chapter upon excess profits duty. Without the fifty pages of index, and another fifty pages of tables of cases and statutes, the book runs to over four hundred pages; but that so much space should be necessary for the adequate treatment of a complicated subject will hardly cause surprise to the reader, after noting in Mr. Redman's preface that "the statutory part of Income-Tax Law consists of siftings from the unrepealed portions of the Income-Tax Acts of 1842 and 1853, and from upwards of fifty Acts of a more or less confusing nature which have been heaped upon them."

Sulphuric Acid Prices.—When referring to the subject of the recent order limiting the price of sulphuric acid [*ante*, pp. 351-75] the "Chemical Trade Journal" on Saturday dealt with the "incidental charges" that it was recommended should be made by the acid maker to cover the cost of filling into tanks, carboys, &c. Our contemporary remarked: Whoever is responsible for the calculation of these "incidental charges," one cannot but be struck by his remarkable propensity for fixing upon conveniently round figures. Without seriously disputing the accuracy of the actuarial value placed upon each of the several services which the acid maker will be called upon to perform, the charge of 10s. per ton for filling acid into the consumers' own carboys appears to us to be a not ungenerous rate of remuneration.

Manchester District Institution of Gas Engineers.—At next Saturday's meeting, the business to be transacted (beyond that already noticed on p. 361 of last week's "JOURNAL") will include an informal discussion on the "Carbonization of Pitch." There are five new members to be introduced—viz., Mr. Samuel Carter, of the Garston Gas-Works, Liverpool, Mr. D. H. Davies, of Nantwich, Mr. E. Hargreaves, of St. Anne's-on-the-Sea, Mr. G. W. Houston, of Crewe, and Mr. Herbert Wrigley, the Resident Manager of the Hollinwood Gas-Works of the Oldham Corporation. The report of the Committee for the twelve months to Jan. 31 will be presented, as also the statement of accounts and the reports of the two Commercial Sections. The introduction by the President for the past two years, Mr. J. G. Newbigging, M.Inst.C.E., of his successor, Mr. E. A. Harman, M.Inst.C.E., of Huddersfield, who will be delivering his inaugural address, will be pleasing features of the gathering.

ELECTRICITY SUPPLY MEMORANDA.

EXCEPT for particularly favoured electricity supply undertakings in industrial centres, this year is not promising at all well. Costs have been ramping upward, consumption has been moving in the contrary direction, and the circumstances of the time are not propitious to the reaping of new business. In many cases, the first advances in price to the consumers have proved their incapacity to overlap or equalize the additional outgoings; and, in consequence, a second increase has had to be made. In this respect electricity undertakings are not peculiar; some gas undertakings have found it necessary to do precisely the same thing—much to their regret. That a sufficiently generous estimate was not at first made as to what would be required to meet the higher disbursements with a reduced business is not a matter upon which blame can be rightly attached to anybody, seeing that the factors in the situation as they now exist were not of sudden birth at the beginning of the war, but have been of progressive development. Just by way of illustration and nothing more, it may be mentioned that the London Electric Supply Corporation, Limited, have announced a further 10 per cent. increase in their charges. The Hackney Electricity Committee recognize that the charges for electricity must now be advanced by 17½ per cent. on the scale existing in July, 1914; and 2½ per cent. discount will be allowed for payment within 14 days. Some of the London undertakings—Chiswick is one of the latest—have notified their customers that they must insist, where the account is not in excess of the figure, on collecting the minimum of 13s. 4d. per quarter allowed by their Provisional Orders. The Brighton Electricity Department is not alone in now having a desire for flat-rates. At Eccles, it is proposed to charge large users a flat-rate of 3d. per unit for a consumption exceeding 10,000 units per annum through one service; the accounts to be subject to 10 per cent. discount. At Salford the price is to be advanced from the 7½ per cent. previously decided upon to 10 per cent. for lighting and 15 per cent. for power. The Reigate Town Council have resolved to raise the price of current for heating from 1d. to 1¼d. per unit; and the occupiers of the Corporation flats at Gillingham are now to pay 8d. per week, instead of 6d. So goes on the necessary game of trying in every direction of business to make things balance through the consumer; but there must come a point at which the masses of the people find outlay has accumulated to such an extent that they perforce must begin to try to counterbalance things by economizing. The lessons of these times will have their effect after the war upon the modes of living of numbers of people.

Making Both Ends Meet.

Where Wealth Abounds.

Not even St. James' and Pall Mall are exempt from the influences of the war. Wealth and luxury are very nice in their way. But they cannot resist the deep impressions that war conditions are making in every direction; and so the St. James's and Pall Mall Electricity Supply Company, with a magnificent lighting load, are finding their happy results of peace times being considerably interfered with. The top line of net profits ("Electrical Industries" states) was reached by the Company in 1913, when the figure was £31,042. In that year the distribution on the ordinary shares was 12 per cent. In 1914, the net profit was down by something like £4000, or to £27,133; and the dividend was shorn of 2 per cent. Now for 1915 the net profit is only £14,335. But by transferring £4500 from the contingency fund, a dividend of 8 per cent. can be paid (against 12 per cent. in 1913), and £2752 be left to be carried forward. The sale of units in 1913 was 11,605,000; and last year, 10,674,000. The Central Electric Supply Company (who produce current in bulk for the Westminster Electric Supply Corporation, the St. James's and Pall Mall Company, and the Chelsea Electricity Supply Company) succeeded last year in making a net balance of £1, compared with £4998 in 1914. No dividend is now being paid; while 5 per cent. is the usual distribution.

Can We Forget?

Mr. A. P. Trotter has made his report to the Board of Trade on the smashing by a motor car (which swerved from the road) of an electric switch-pillar at Eastbourne, on Dec. 26 last, whereby two men who tried to render assistance lost their lives through electric shock, and several other good-natured persons, with an equal knowledge of the performances of electricity, also, at some personal inconvenience, acquired certain knowledge as to its potentialities. An attempt was made to rescue, by the use of a wire rope, the two men who were killed. Had a hemp rope been used, the day being dry, the men might have been rescued, or they might have been pulled away by the loose parts of their clothing; and if, after getting them clear, the well-known means of artificial respiration had been practised, the lives of the men might have been saved. Mr. Trotter makes certain recommendations. This electric-switch pillar-box stood on the edge of the footpath, which was not provided with a curb. Obviously, says Mr. Trotter, the switch pillar-box should be placed farther from the side of the road, better in side streets than in main thoroughfares, and better still if accommodation can be found for them in the walls of houses or gardens. Among other recommendations

the "Electrical Review" finds three which, it thinks, reflects "that spirit which, before the war, could be discerned in so many official decrees, especially in connection with electrical undertakings of every description." It refers to "the bureaucratic tendency continually to impose fresh burdens upon them, to add to the multitude of restrictions by which they are bound." The proposals, which are designed to protect the public, are, from the engineering point of view, simple, and could be made perfectly safe. They are that a curb, not less than 6 inches in height, should extend not less than 10 feet on each side of the pillar; where pillars are set near a curb, feeders or "spurs" of rounded blocks of stone or strong iron castings could be usefully set at the corners of the pillars facing the road; and cast-iron pillars should be reinforced by a cage of wrought-iron rods, or an inner lining of sheet or expanded metal or wire mesh should be attached to the pillar and to the doors, and the pillar should be connected to a substantial earth plate, as well as to the head of the cables. Our contemporary comments: "Why all this panic? Men and women are dying in hundreds around us—in the Metropolitan area alone on the average three persons are killed every day by vehicles, and nearly eighty are injured; but no suggestion is made to fit all vehicles with pneumatic buffers, or provide pedestrians with compulsory crinolines." These words are in the paper which published the celebrated "Lest we Forget" article in connection with a certain railway accident, the writer of which article appeared to have had his slumbers seriously disturbed by the part which, he was under the impression, gas had in such accidents. The same contemporary does not publicly confess to suffer the same amount of anguish when there are certain terrible occurrences that are without any shadow of doubt attributable to electricity. Mr. Trotter may remember the "Lest we Forget" article, and ask himself "'Why all this panic?' over my simple proposals in the interests of the public?" For our own part we cannot see any analogy between the hundreds of thousands of fast-moving vehicles in London streets, and widely spaced fixed switch pillar boxes of an electricity distribution system.

Unreliable Cookers.

Evidently the Gillingham Town Council are not altogether satisfied with the fallibility of electric-cookers. In future, it seems, they wish to keep clear of having any obligation upon them in respect of the maintenance of such apparatus. They have resolved that, "owing to the difficulty of obtaining supplies of reliable apparatus, no more electric-cookers are to be issued until a hire-purchase scheme is introduced after the war. But the existing cookers are to be maintained as at present." It is obvious from this that the Council are desirous hereafter of only doing business in electric-cookers on the hire-purchase system, and to shift maintenance, &c., from their own shoulders on to those of the people who are soft enough to put their trust in electricity for culinary operations. The wife of a gentleman intimately interested in an electricity undertaking was not a great while ago heard to remark in a gas-showroom: "My husband insists on an electric-cooker staying in my kitchen; but I have insisted on having a gas-cooker there as well." Reliability and time were the factors that told in favour of the latter in that case. The accounts were paid by the husband. Even the "shrinkage of meat" fiction had no effect on the lady.

A Blessing in Disguise.

People have different ways of looking at things, and of expressing themselves in regard to them. The Hastings Corporation Electricity Committee recently applied to the Local Government Board for sanction to the borrowing of £500 for the provision of house services for electric lighting. But the only satisfaction the Committee got was to be told that the Board confirmed the circular sent out last March, in which it was stated that they were not now sanctioning any loans save for matters of pressing necessity, for reasons of public health, or else on account of war requirements. At a recent meeting of the Corporation, Alderman Chesterfield said he thought this was rather a "serious matter;" but perhaps it was a "blessing in disguise," because it showed the futility of applying for loans except for matters of public health. He left his hearers to choose between the "serious matter" and the "blessing in disguise." We rather think the alderman himself is in favour of the "blessing in disguise," because he added "they would not for years see a loan granted except for matters of public health." This will certainly be a "blessing in disguise" for those electricity undertakings that have not shown up well in the matter of economical and productive expenditure.

Breakdowns.

The fresh crop of breakdowns of electicity supply which we recently noticed have not in all cases had their causes explained. The causes of such interruptions are varied—in fact, there seems to be no end to them. Reports have been issued as to the breakdown at Wallasey and the more imposing one at Wigan. At Wallasey, the trouble was in connection with the new power station, and was due to the stoppage of the circulating water. Three days were required in order to set things right. At Wigan, the cessation of supply was due to the overstraining of the plant, through excessive demand—the scene of the mischief being the boiler-room. The breakdown took place on Jan. 22. The lighting supply was available on the following day; the power supply on Monday, Jan. 24; but the trams were not in full running until Jan. 27. Altogether, electricity supply has been in for a bad time lately in the matter of its propensity for leaving people in the lurch, and the people who have been left in the lurch have not deemed themselves fortunate.

Losses from Electric Water-Heaters.

Perpetual care must be taken with heating by electricity to see that the thermal losses are reduced to a minimum. This point is hammered into people on every possible occasion, and in connection with every form of electric heating apparatus. It is a necessity enforced by the low thermal value of electricity relative to its cost. The heating efficiency of an electric appliance has no relation whatever to the terrific loss of B.Th.U. that occurs in getting heating energy in the form of electricity to the apparatus. The amount reaching the apparatus is a very slight proportion of the heat units of the fuel placed under the boilers at the electricity station. We see the care enjoined in connection with electric-ovens, which should be thickly lagged, practically unventilated, and the doors should never be opened while food is being cooked. Electric-fires, too, should be used in rooms without chimneys, so as to lose as little as possible of the precious heat; and electric water-heaters should be made so that the heating elements are like islands surrounded by water, and then what heat is lost will not be chargeable to the elements but to the water. All through we see the devoted anxiety necessitated by circumstances. Herr Rittershausen in the "Electrotechnische Zeitschrift" has been writing on the subject of the losses in electric water-heaters. So precious, we see, is the heat that none should be lost through the escape of steam. He therefore prefers the closed type of apparatus, which can be heated up to a temperature of (say) 90° C. [194° Fahr.]; this being the highest temperature which allows the water to be heated without "serious" loss of steam. This is because the apparatus is closed and under pressure. The open type loses much heat because steam passes off at temperatures much below the boiling-point. Water expands by 3·5 per cent. between 10° C. and 90° C. This volume is lost, and escapes in the open type, while it presses the cold water backwards in the closed type. Naturally his fancy is for the immersed heater. In types with the heating element at the sides or bottom of the heater, he gives precedence to the side fixing, and not the bottom, because the deposit from the water causes the work of the heater to become increasingly unfavourable. The hot water, too, is generally cloudy, owing to continual agitation of the sediment. A "very serious" loss is that which occurs through the metallic connections between the water-container and the external casing or the air. The loss due to the inflow-pipe can be lessened by having a cold zone in the bottom of the boiler. The outflow-pipe must naturally be connected so as to draw water from the top of the boiler. Herr Rittershausen recommends, as a simple remedy against loss, the bringing of the outlet-pipe vertically downwards through the heater, and so allow the water to pass out of the bottom. But what about the chilling effect on the water in the outlet-pipe through the loss to the cool zone of water (through which the inflow-pipe is made to pass), unless the pipe is taken out laterally before reaching this point? As it is necessary to maintain as large a supply of hot water as possible at the top of the boiler, baffle-plates should be employed, so as not to allow eddies to be set up. If an electric boiler can be made with a mean efficiency of between 90 and 94 per cent., Herr Rittershausen contends that it can compete with boilers heated by other means, if energy can be obtained at ½d. per unit; but, if the efficiency is lower, then the cost of the energy must also be lower. Other authorities put the essential competing cost at a lower figure still; and they are right. There are other than heat losses in connection with electric water-heaters. There are the losses of time and temper, and the losses of household efficiency and general convenience through not being able to obtain large supplies of heated water quickly as well as economically.

The "Cambridge" Optical Pyrometer.

Among the many pieces of apparatus of the Cambridge Scientific Instrument Company which are found extremely useful in gas-works practice may be mentioned the "Cambridge" optical pyrometer, for reading temperatures of from 700° to 4000° C. This appliance is the subject of an illustrated descriptive leaflet just issued by the Company, in which the statement is made that it can be used by any person without technical knowledge, and on account of its construction accurate observations can be taken repeatedly by different operators. The measurements are based upon the formula of Professors Paschen and Wien for the relationship between light intensity and temperature; the constants for each instrument being individually determined before calibration. Behind an enlarged part in the front of the pyrometer, in which is fitted the electric lamp, there are two holes. Light from the object under observation passes through one, and light from the lamp through the other. These beams of light then pass through a system of lenses and prisms, are polarized in different planes, and rendered monochromatic. Finally, the two beams of light pass through a single ocular. The observer sees an illuminated circular field divided into two semicircles—one filled by an image of the hot body under observation, and the other uniformly illuminated by the electric lamp. The two semicircles are brought to an equal intensity of illumination by turning the eye-piece to which the scale-pointer is directly attached. In this manner, the unknown rays are compared with those of known intensity from the electric lamp.

CARBONIZATION OF COAL IN GAS-WORKS.

Vertical Retorts at Alloa.

MUCH practical information with regard to the distillation of coal in vertical retorts was contained in a paper which was read by Mr. J. W. Napier, of Alloa, before the Edinburgh and East of Scotland Section of the Society of Chemical Industry, at a meeting which took place in Edinburgh last Wednesday. In view of the fact that his paper was addressed to an audience that, generally speaking, might not have very intimate association with the gas industry, he did well to emphasize in his opening remarks the important place among the manufactures which the industry holds, especially when considered in connection with the bye-products. This done, he proceeded directly to the subject of the paper—the very considerable and real progress which has been attained during recent years in the manufacture of coal gas and bye-products, especially as regards the economics of the industry. As to the future of the economics of gas production and of residuals, this, he asserted, lies almost entirely in the domain of the chemist. "It has been imputed," he said, "that in gas manufacture the chemist has not succeeded in any very measurable degree in enhancing the value of gas-works methods, and that his investigations are only explanatory of what is taking place, and not inventive of new methods. This declaration bears a false meaning, because undoubtedly the chemist has given knowledge and understanding, without which there would not be the same high degree of efficiency as that already reached. Between the pure scientist and the manufacturer there arises too frequently as a barrier the commercial side of the business; and this aspect of the situation accounts for much."

For nearly two years past, the whole of the gas required at Alloa has been produced in vertical retorts; and some particulars of the six beds of four retorts each (24 in all) which have been installed, were given in the paper, with a plan and some photographs indicating clearly the arrangement of the complete plant. The retorts are on the continuous-intermittent system; and the overhead coal storage hoppers have a capacity equal to 48 hours' requirements. From the experience Mr. Napier has gained, he would not advise hoppers of a less size than this. There are overhead coke-hoppers for the supply of fuel to the producers; and the same capacity has been arranged for in this case. It was pointed out that the outstanding feature of coal-carbonizing plant on the vertical system is the absence of machinery for the charging and discharging operations; the law of gravity having been fully taken advantage of, with the result that there is "a combination of conditions of working and economy in labour costs never before approached." At Alloa, the output for which 88 horizontal retorts were needed is provided by twelve vertical retorts.

One matter to which the author drew attention was the considerable flexibility in the working of the retorts as regards throughput; and in this connection he related his experience of the past year. It seems that in the summer months twelve retorts were in use for a daily output of 320,000 to 350,000 cubic feet; the make per retort per 24 hours being from 27,000 to 30,000 cubic feet. During the past winter the same number of retorts have sufficed to meet the daily demand of 600,000 to 650,000 cubic feet; the make of gas per retort per 24 hours having increased to 53,000 cubic feet as a maximum. As a matter of fact, the average figure for November was 48,967 cubic feet. The same number of men, too, were employed at the maximum time of output as at the minimum. These results were effected by increasing the temperature of the retorts, giving a larger throughput of coal, and by judicious admission of steam, whereby a quantity of water gas was made; the amount of steam used being governed by the necessity of preserving a certain standard quality of gas.

Dealing with the matter of saving, in figures, Mr. Napier stated that, for a complete working year with horizontal retorts and machine charging only, with hand drawing of coke, stokers' wages amounted to £1825, or 2s. 2¾d. per ton of coal carbonized, and 2·82d. per 1000 cubic feet of gas made. In twelve months with verticals, stokers' wages were £702, or 1s. 0½d. per ton of coal, and 1·1d. per 1000 cubic feet of gas. This represents a saving of £1123, with practically the same output of gas. In the case of the vertical retorts, too, the wages cost includes all handling of coal and coke, labour at boiler for steam-raising for the whole works supply, cleaning of producers, and other work. Two men only are employed per shift of eight hours; in fact, during the night and on Sundays these are the only employees who are left on the works.

Results of working tests, using Blairhall nuts, were quoted; and these showed a make per ton of coal (corrected) of 12,180 cubic feet. In a comparison of the chief results of working as between horizontal and vertical retorts (the data being obtained over a complete twelve months' working), the figures of gas made per ton of coal were 11,455 cubic feet in the case of the verticals, and 9468 cubic feet for the horizontals. In order to present the matter in as clear a manner as possible, the author also quoted a careful calculation made by him of the exact amount of increased value obtained from a ton of coal in vertical retorts, including wages economy (but taking no account of the saving in repairs and maintenance of plant). This increased value per ton of coal he finds to be: Gas, 2½d.; tar, 8¾d.; sulphate of ammonia, 4¾d.; coke, 1s. 1½d.; saving in wages, 1s. 2¼d.—or a total of 3s. 7¾d.

Mr. Napier explained in the course of the paper that, with the continuous-intermittent system, the outstanding feature of advantage is undoubtedly the quality of coke produced, as regards its physical condition. It is, he said, conceded that, in order to make coke of high quality, as, for example, in the coke-oven, a period of rest for the material in the retort is a necessity. The quality of the coke as regards appearance, size, and small quantity of breeze made, is distinctly in favour of this system; and the advantage in this respect is, in his experience, considerable. Even in practical working with the intermittent retorts, it has been found by him that when the coke was discharged more frequently in small quantities in from one to two hours, instead of four to five hours, there was a marked difference in the size of the coke, which was undoubtedly due to the absence of the period of rest-time. The moisture content with this system is not more than 1 per cent.; while analyses which were set forth in the paper showed that the quality of vertical retort coke compares most favourably with the special coke prepared for malting purposes. Mr. Napier stated that it has been in use during the past twelve months in a number of breweries, and that there is no reason why gas-works having vertical retorts should not be able to meet the requirements of brewers in the matter of coke. Another purpose for which it is suitable is for suction producers; the very small quantity of volatile matter present obviating tar troubles in the working of gas-engines. The quality of vertical-retort tar, he went on, shows it to be more a product of low-temperature distillation; and it contains a large amount of paraffins and less benzene and toluene. As a product of a higher temperature, horizontal retort tar contains a much larger percentage amount of the aromatic hydrocarbons; and the necessity of changing the character of the vertical-retort tar in view of the present urgent need for benzene and toluene, is a subject demanding experimental investigation.

Some attention was devoted by the author to nitrogen in coals and the ammonia yield; it being pointed out that the results of tests by him of coal for nitrogen, are in agreement with what has been found by other observers—that the nitrogen content of a coal is no reliable guide to the ammonia yield on carbonization. From 50 to 65 per cent. of the nitrogen in the original coal is left in the coke. An analysis of vertical retort coke gave 1·54 per cent. of nitrogen—equal to 34·49 lbs. of nitrogen, or 162·6 lbs. of sulphate of ammonia, per ton of coke. There is a difficulty here; and Mr. Napier said that the problem which now presents itself is the possibility of the recovery of a larger proportion of the nitrogen left in the coke under gas-works conditions. It may, he remarked, be stated quite safely that any attempt to recover a large amount of the total available can only be made by complete combustion of the coke. Allusion was made to the experiments over thirty years ago of Tervet, and to what has been accomplished by the Mond process; the result of due consideration of the matter being to bring the gas manufacturer back to the problem of increasing the ammonia yield from the coke before it leaves the retort.

For the purpose of ascertaining what higher yield of ammonia it was possible to obtain by passing steam into the mass of red-hot coke at the bottom of the vertical retort, the author adjusted the heating of the retorts so as to have a comparatively low temperature at the top for a distance from 6 to 8 feet down; while the temperature near to the bottom, except for the last 3 to 4 feet, was increased in order to ensure the decomposition of the water vapour in the mass of red-hot coke. The amount of steam used was limited by the quantity of water gas produced, and the need for maintaining the illuminating properties of the gas without too much enrichment. The use of steam, therefore, was intermittent; and it was not possible to obtain the advantage of anything like an excessive amount, which would have helped to protect the ammonia. However, even under these conditions, the yield of ammonia for a complete month's working showed a small increase. Without steam, under normal conditions, the production of sulphate of ammonia per ton of coal was 25·88 lbs.; with steam, it was 27·86 lbs. At the same time, the make of gas per ton of coal was increased to 13,164 cubic feet.

With restrictions as to illuminating power and heating value of the gas, it is, concluded Mr. Napier, fairly evident that the conditions existing in the retort are opposed to anything like a large increase in yield of ammonia being obtained. He is, however, of opinion that catalysis will probably in the end afford a surprising result. While admitting that surmise of this kind may not be very hopeful, he pointed out that in not a few technical processes on the large scale, it has been found that the presence of a suitable catalyst has yielded most unexpected results. During the last three years of his working with horizontals, Mr. Napier experienced an exceptionally large amount of cyanogen in his gas, due to high temperatures, owing to shortage of carbonizing plant, and perhaps unevenness of the layers of coal in the retorts; but since the verticals have been in operation, all traces of an excess of cyanide have disappeared.

The Committee of the Privy Council for Scientific and Industrial Research have appointed the Hon. Sir Charles A. Parsons, K.C.B., F.R.S., a member of the Advisory Council, in place of Professor Bertram Hopkinson, F.R.S., who has been forced to resign by the pressure of his military duties and special work connected with the war. They have also appointed Professor Jocelyn Field Thorpe, F.R.S., to fill the vacancy on the Advisory Council caused by the death of Professor Raphael Meldola, F.R.S.

COMPARATIVE WORKING RESULTS OF THE THREE METROPOLITAN AND FOUR OF THE SUBURBAN GAS COMPANIES.

IN THE HALF YEAR ENDED DEC. 31, 1915.

Compiled by Mr. F. J. BRADFIELD, the Secretary of the Commercial Gas Company.

	Gas Light and Coke.	South Metropolitan.	Commercial.	Brentford.	Wandsworth.	South Suburban.	Tottenham.
Gas sold . . . . . thousands	12,905,757	6,218,421	1,677,383	1,885,501	1,204,737	1,027,770	1,171,289
Increase . . . . . per cent.	1·40	Dec. 2·03	1·48	4·43	0·52	1·01	4·89
Gas made per ton of coal . . . . cubic feet	12,791	12,278	13,956	12,229	12,507	12,592	12,451
„ „ per gallon of oil . . . . „	403	..	449	480	398	427	405
Gas unaccounted for . . . . . per cent.	5·58	6·92	9·40	7·48	6·30	9·67	11·75
Coke made for sale per ton of coal . cwt.	9·96	9·38	11·16	10·46	11·10	10·17	9 32
Tar made per ton of coal . . . . galls.	9·89	9·67	11·36	11·05	9·32	10·50	..
Liquor made per ton of coal . . . galls, 8 oz.	37·48	40·77	36·27	33·06	35·20	37·34	33·31
Percentage of coke used as fuel	19·70	24·02	10·74	16·19	11·16	21·78	24·47
Capital expended per 1000 cubic feet sold during the past year	s. d. 11 0·12	s. d. 8 5·81	s. d. 8 6·39	s. d. 7 2·36	s. d. 7 9·24	s. d. 9 10·25	s. d. 8 8·05
Price charged per 1000 cubic feet	3/0 and 2/10	2/10	2/8	2/4 to 3/6	2/1 to 3/1	2/10 to 4/7	2/3 and 2/11
Costs per 1000 Cubic Feet of Gas Sold.							
REVENUE ACCOUNTS.	d.	d.	d.	d.	d.	d.	d.
Coals, oil, &c.	19·76	24·95	17·41	18·93	19·52	24·48	19·22
Less residuals—Coke and breeze	7·38	10·62	6·66	5·83	9·10	9·59	5·61
Tar	1·54	2·53	1·48	1·27	1·42	1·54	0·71
Amm. liq. and sulph. amm.	2·24	2·18	1·90	1·02	2·20	2·39	1·24
Total residuals . . .	11·16	15·33	10·04	8·12	12·72	13·52	7·56
Net for coals, oil, &c.	8·60	9·62	7·37	10·81	6·80	10·96	11·66
MANUFACTURE—							
Salaries	0·30	0·74	0·44	0·48	0·31	0·62	0·30
Wages—carbonizing	1·90	2·01	1·66	1·53	1·98	1·31	1·63
Purification	0·22	0·48	0·15	0·31	0·13	0·22	0·31
Repairs—plant	4·87	3·84	4·39	4·05	4·92	3·68	4·00
Net manufacture . .	15·89	16·69	14·01	17·18	14·14	16·79	17·90
DISTRIBUTION—							
Wages and salaries	1·18	0·89	0·85	1·01	1·28	1·64	0·92
Repairs—Mains and services, &c.	1·79	1·46	1·47	1·20	3·04	2·27	2·63
„ Meters and prep. meters and fittings	1·98	2·44	2·05	0·95	0·83	3·33	1·70
„ Stoves—ordinary and prepayment .	1·99	1·33	1·67	1·66	1·59	2·94	1·29
Total net manufacture and distribution .	22·83	22·81	20·05	22·00	20·88	26·97	24·44
Public lamps—lighting and repairing	0·54	0·59	0·39	0·40	0·50	0·81	0·36
Rents, rates, and taxes	3·34	2·28	2·35	1·93	1·04	1·79	2·24
MANAGEMENT—							
Directors, Auditors, and salaries (Secretary, &c.)	0·27	0·26	0·33	0·42	0·58	0·86	0·48
Collectors	0·54	0·68	0·79	0·52	0·50	0·59	0·47
Stationery and general charges	0·31	0·65	0·58	0·30	0·44	0·52	0·49
Profit-sharing	0·09	0·27	0·34	..	0·42	0·23	0·41
Bad debts	0·14	0·09	0·05	0·10	0·07	0·09	0·03
Law and parliamentary charges	0·01	0·08	0·02	0·02	0·04	0·07	0·04
Superannuations, &c.	0·51	0·65	0·36	0·51	0·41	0·58	0·34
National Insurance	0·08	0·09	0·07	0·06	0·08	0·08	0·05
Active service allowances and war bonus . . .	0·13*a*	1·22	0·35*a*	1·20	1·57	1·09	1·15
Sundries	0·04	0·03	0·03	0·00	0·01	..	..
Total expenditure (*less* residuals) . . .	28·83	29·70	25·71	27·46	26·54*e*	33·68	30·50
GAS	35·31	33·23	31·15	28·35	28·93	37·42	27·49
Rentals—Meters and prep. meters and fittings	3·18	3·34	2·99	4·25	2·98	2·38	1·99
Stove	1·47	1·49	1·88	1·19	2·54	1·98	4·25
Incand. mantle maintenance . . .	..	..	0·10	..	0·14	..	0·11
Miscellaneous	0·11	0·06	0·00	0·01	0·07	0·10	0·06
Total—Gas, rentals, &c.	40·07	38·12	36·12	33·80	34·66	41·88	33·90
Balance, being profit	11·24	8·42	10·41	6·34	8·12	8·20	3 41*g*
Dividend and interest	10·16	7·30	8·47	7·32	7·06	7·91	5·66
Surplus	1·08	1·12	1·94	Def. 0·98	1·06	0·29	Def. 2·25
Contributions to funds and sundry payments . .	0 74*b*	0·39*c*	..	0 28*d*	0·37*f*	..	0·30*h*
SUNDRIES.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Coals cost per ton	21 4·85	23 4·82	19 8·69	..	19 6·77	..	20 11·58
Coke realized per ton of coal	8 10·85	9 8·13	9 9·15	9 1·12	10 0·47	11 4·68	8 4·82
Coke „ „ of coke	17 10·59	20 7·60	17 5·98	17 4·55	18 0·97	22 4·88	18 0·33
Breeze „ per ton	4 4·74	4 2·77	3 10·31	5 4·09	1 11·98	5 0·42	0 8·62
Tar realized per gallon	0 2·42	0 2·94	0 2·03	0 1·78	0 1·91	0 2·11	0 1·45
Amm. liquor, &c., realized per butt (8 oz.) . .	5 9·04	5 4·93	8 6·53	5 3·58	7 7·74	8 3·97	6 0·42
Percentage of stoves at rental to consumers . .	82	99	72	97	92	100	70
Bad debts per cent. on total receipts.	0·28	0·17	0·12	0·22	0·15	0·16	0·8
Net profit per cent. on ordinary capital . . .	4·82	5·28	6·16	4·66	6·98	5·06	2·42*g*
One penny variation equals in half year . . .	£53,774	£25,910	£6989	£7856	£5020	£4282	£4880
Carb. water gas, per cent. on total make . . .	23·47	..	31·23	41·39	15·40	21·97	40·11

a On Active Service Allowances only.
b Writing-down Consols Special Purposes and Redemption Funds.
c Insurance Fund.
d Writing-down Investments and Stamp Duty.
e Capital Duty eliminated.
f Capital Duty.
g Including Electricity Profits.
h Cost of Converting Consols.

COMPARATIVE WORKING RESULTS OF THE THREE METROPOLITAN AND FOUR OF THE SUBURBAN GAS COMPANIES.

TABLE SHOWING THE VARIATION, INCREASE OR DECREASE, ON FIGURES OF CORRESPONDING HALF YEAR, 1914

[The figures in heavy type show the decreases.]

Compiled by Mr. F. J. BRADFIELD, the Secretary of the Commercial Gas Company.

——	Gas Light and Coke.	South Metropolitan.	Commercial.	Brentford.	Wandsworth.	South Suburban.	Tottenham.
Gas sold . . . . . thousands	178,716	**129,187**	24,514	173,912*	6,238	10,312	54,602
Increase (variation equal to) . . . per cent.	6·12	2·26	5·24	2·68	**·28**	·86	4·68
Gas made per ton of coal . . . . cubic feet	371	**336**	159	116	112	**505**	**475**
,, ,, per gallon of oil . . . . ,,	**39**	..	**13**	11	23	**34**	**33**
,, unaccounted for . . . . . per cent.	**1·06**	·33	1·11	·90	**·48**	·92	3·39
Coke made for sale per ton of coal . cwt.	·13	·42	·07	·33	·25	**·26**	·06
Tar made per ton of coal . . . . galls.	**·61**	·16	·27	**·05**	·06	·78	..
Liquor made per ton of coal . . galls, 8 oz.	·97	**·64**	**3·35**	**2·39**	**3·75**	**1·97**	**·58**
Percentage of coke used as fuel	**·65**	**3·35**	**·51**	**2·79**	**2·02**	2·01	**·78**
Capital expended per 1000 cubic feet sold during the past year	s. d. 0 0·83	s. d. 0 5·48	s. d. **0 0·82**	s. d. 0 0·07	s. d. 0 4·50	s. d. **0 0·32**	s. d. **0 1·26**
Price charged per 1000 cubic feet†	0 6·00	0 8·00	0 4	..	0 4·00	0 7·00	0 3·00
Costs per 1000 Cubic Feet of Gas Sold.							
REVENUE ACCOUNTS.	d.	d.	d.	d.	d.	d.	d.
Coals, oil, &c.	4·58	9·69	1·92	3·91	2·26	7·45	3·87
Less residuals—Coke and breeze	2 58	4·90	1·96	2·01	2·91	4·36	1·76
Tar	·25	1·41	·12	**·01**	**·05**	·07	**·37**
Amm. liq. and sulph. amm .	·83	**·05**	·44	·24	·52	·82	·29
Total residuals . . .	3·66	6·36	2·52	2·24	3·38	5·25	1·68
Net for coals, oil, &c.	·92	3·33	**·60**	1·67	**1·12**	2·20	2·19
MANUFACTURE—							
Salaries	·00	·03	·02	**·01**	·00	**·03**	·01
Wages—carbonizing	·18	·15	·11	**·01**	·00	·02	·19
Purification	**·03**	**·19**	**·01**	**·10**	·02	·08	·02
Repairs—plant	·89	**·22**	**·08**	**·05**	·69	·46	·85
Net manufacture . .	1·96	3·10	**·56**	1·50	**·41**	2·73	3·26
DISTRIBUTION—							
Wages and salaries.	·06	·08	·08	**·26**	**·08**	·21	**·09**
Repairs—Mains and services, &c. . . .	·03	·04	**·07**	**·81**	1·18	**·47**	**·61**
,, Meters and prep. meters and fittings	·00	·19	**·05**	**·19**	**·22**	1·05	**·23**
,, Stoves—ordinary and prepayment .	·02	**·01**	·09	**·20**	**·02**	1·43	·02
Total net manufacture and distribution .	2·07	3·40	**·37**	·04	·45	4·95	2·35
Public lamps—lighting and repairing	·00	·01	**·01**	**·10**	**·03**	**·04**	**·05**
Rents, rates, and taxes	·14	·04	·06	**·03**	·00	**·06**	·32
MANAGEMENT—							
Directors, Auditors, and salaries (Secretary, &c.)	·01	·00	·00	**·02**	·00	·02	**·04**
Collectors	·03	·03	·04	**·02**	·02	·03	**·02**
Stationery and general charges	·02	·05	·08	**·05**	**·22**	**·07**	**·07**
Profit-sharing	**·23**	**·49**	**·20**	..	**·08**	**·31**	**·13**
Bad debts	·03	·02	**·01**	·02	·01	·04	**·01**
Law and parliamentary charges	**·01**	·05	**·03**	**·68**	·04	·06	·01
Superannuations, &c.	**·15**	·29	**·01**	**·01**	**·30**	**·10**	**·25**
National Insurance	·00	·03	·00	·00	**·02**	**·01**	**·01**
Active Service Allowances and War Bonus . .	·13	1·22	·35	1·20	1·57	1·09	1·15
Sundries	·00	·00	·01	·00	·00	..	..
Total expenditure (*less* residuals) . . .	2·04	4·65	**·09**	·35	1·44	5·57	3·25
GAS	4·76	6·25	3·65	·20	3·89	5·80	**2·21**
Rentals—Meters and prep. meters and fittings	·00	**·01**	**·10**	·48	·01	**·16**	**·05**
Stove	·05	·03	·08	·05	·18	·20	·30
Incand. mantle maintenance . . .	..	..	**·02**	..	**·19**	..	**·04**
Miscellaneous	**·01**	·00	·00	·00	·00	·04	·00
Total—Gas, rentals, &c.	4·80	6·27	3·61	·73	3·89	5·88	2·42
Balance, being profit	2·76	1·62	3·70	·38	2·45	·31	**·82**
Dividend and interest	**·97**	**·47**	**·90**	·04	**·25**	**·88**	**·67**
Surplus	3·73	2·09	4·60	·34	2·70	1·19	**·15**
Contributions to funds and sundry payments .	·55	·39	..	**·12**	**·01**	..	**·24**
SUNDRIES.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Coals cost per ton	5 3·03	8 7·25	1 10·30	..	2 6·65	..	2 9·34
Coke realized per ton of coal	2 11·29	4 1·65	2 10·74	3 0·96	3 8·95	5 1·29	2 8·39
Coke ,, ,, of coke	5 9·01	8 3·16	5 1·41	5 6·09	6 5·78	10 4·33	5 8·59
Breeze ,, per ton	2 2·90	3 11·77	0 5·43	0 11·76	**0 1·60**	..	..
Tar realized per gallon	0 0·51	0 1·57	0 0·07	**0 0·07**	**0 0·03**	**0 0·10**	**0 0·34**
Amm. liquor, &c., realized per butt, 8 oz. . .	0 3·79	0 0·37	2 5·56	1 5·86	2 8·39	3 0·86	1 5·22
Percentage of stoves at rental to consumers . .	3	2	4	..	3	5	8
Bad debts per cent. on total receipts	·01	·00	**·03**	·02	·00	·04	**·03**
Net profit per cent. on ordinary capital . . .	1·87	·88	2·49	**5·29**	2·72	·18	**·94**
One penny variation equals in half year . . .	£745	£538	£102	£724	£26	£43	£227
Carb. water gas per cent. on total make . . .	**3·10**	..	**·78**	**·58**	4·75	3·0	4 00

* This figure represents the variation on the absorbing Company's own figures, and not on those of the amalgamating Companies, whereas on the preceding table the increase on the "Gas Sold" is on the amalgamated figures.

† These figures show the increases in price in the Companies' principal areas.

METROPOLITAN GAS REFEREES' NOTIFICATION.

Alterations for 1916.

VARIOUS alterations are contained in the "Notification" for the current year of the Metropolitan Gas Referees, of which we have received an advance copy. In the first place, there are twelve testing-stations in the area of the Gas Light and Coke Company, instead of fourteen as formerly; the two removed from the list being the offices of the London County Council, Spring Gardens, and No. 1, Vinery Villas, North Bank, Regent's Park. There are some alterations in the following section—the varied portions being printed in italics.

MODE OF TESTING FOR SULPHUR COMPOUNDS OTHER THAN SULPHURETTED HYDROGEN.

This testing shall be made on such days as the controlling authority shall direct. [London Gas Act, 1905, section 5 (5).] The apparatus to be employed is to be set up in a room or closet where no other gas is burning. The gas shall pass through a meter by reference to which the rate of flow can be adjusted, and which is provided with a self-acting movement for shutting-off the gas when 10 cubic feet have passed.

Pieces of sesquicarbonate of ammonia, from the surface of which any efflorescence has been removed, are to be placed round the stem of the burner. The index of the meter is to be then turned forward to the point at which the catch falls, and will again support the lever-tap in the horizontal position. The lever is made to rest against the catch so as to turn on the gas. *The index on the long hand is turned forward through nearly four turns, and the burner lighted. When the index is close to zero and the unit hand at 4 the trumpet-tube is placed in position on the stand and its narrow end connected with the tubulure of the condenser.* At the same time the long chimney-tube is attached to the top of the condenser.

As soon as the testing has been started, a first reading of the aerorthometer is to be made and recorded, and a second reading as near as may be to the time at which the gas is shut off. The rate of burning, which with practice can be judged very nearly by the height of the flame, is to be so adjusted that the meter hand shall make half a revolution in not less than four minutes.

After each testing, the flask or beaker which has received the liquid products of the combustion of 6 cubic feet of gas is to be emptied into a measuring cylinder, and then replaced to receive the washings of the condenser. Next the trumpet-tube is to be removed and well washed-out with distilled water in the measuring cylinder. The condenser is then to be flushed twice or thrice by pouring quickly into the mouth of it 40 or 50 cubic centimetres of distilled water. These washings are brought into the measuring cylinder, whose contents are to be well mixed and divided into two equal parts.

One-half of the liquid so obtained is to be set aside, in case it should be desirable to repeat the determination of the amount of sulphur which the liquid contains.

The other half* of the liquid is to be brought into a flask, or beaker covered with a large watch-glass, treated with hydrochloric acid sufficient in quantity to leave an excess of acid in the solution, and then raised to the boiling-point. An excess of a solution of barium chloride is now to be added, and the boiling continued for five minutes. The vessel and its contents are to be allowed to stand till the barium sulphate has settled at the bottom of the vessel, after which the clear liquid is to be as far as possible poured off through a paper filter. The remaining liquid and barium sulphate are then to be brought on to the filter, and the latter is to be well washed with hot distilled water. [In order to ascertain whether every trace of barium chloride and ammonium chloride has been removed, a small quantity of the washings from the filter should be placed in a test-tube, and a drop of a solution of silver nitrate added. Should the liquid, instead of remaining perfectly clear, become cloudy, the washing must be continued until on repeating the test no cloudiness is produced.] Dry the filter with its contents, and transfer it into a weighed platinum crucible. Heat the crucible over a burner, increasing the temperature gradually, from the point at which the paper begins to char, up to bright redness.† When no black particles remain, allow the crucible to cool; place it when nearly cold in a desiccator over strong sulphuric acid, and again weigh it. The difference between the first and second weighings of the crucible will give the number of grains of barium sulphate. *Multiply this number by 4·58; the result is the number of grains of sulphur in 100 cubic feet of the gas.*‡

This number is to be corrected for the variations of temperature and atmospheric pressure in the manner indicated under the head of "Illuminating Power," with this difference, that the mean of the first and second aerorthometer readings shall be taken as the reading.

The correction by means of the aerorthometer reading may be made most simply and with sufficient accuracy in the following manner:

When the aerorthometer reading is between
·955-·965, ·965-·975, ·975-·985, ·985-·995,
diminish the number of grains of sulphur by 4, 3, 2, 1 per cent.

When the aerorthometer reading is between ·995-1·005, no correction need be made.

When the aerorthometer reading is between
1·005-1·015, 1·015-1·025, 1·025-1·035,
increase the number of grains of sulphur by 1, 2, 3 per cent.

Example:—

Grains of barium sulphate from 3 cubic feet of gas	6·2
Grains of sulphur in 100 cubic feet of gas (uncorrected) 6·2 × 4·58 = ...	28·40
Add 28·6 × $\frac{3}{100}$ = . . .	·57
Grains of sulphur in 100 cubic feet of gas (corrected) . . .	28·97

Aerorthometer reading 1·018

Result: 29·0 *grains.*

The aerorthometer reading is the reciprocal of the tabular number. The gas examiner shall, not less often than once a month, compare the aerorthometer reading with the reciprocal of the tabular number deduced from observations of the barometer and thermometer; and if there is a difference of more than one-half per cent., the aerorthometer is to be readjusted.

PREPARATION OF PENTANE.

The pentane to be used in the 10-candle lamp should be prepared in the following manner:

Light Pennsylvanian or other petroleum similarly consisting almost wholly of the lighter hydrocarbons of the paraffin series is to be further rectified by three distillations, at 55°, 50°, and 45° C. in succession. The distillate at 45° is to be shaken up from time to time during two periods of not less than three hours each with one-tenth its bulk of (1) strong sulphuric acid, (2) solution of caustic soda. After these treatments, it is to be again distilled, and that portion is to be collected for use which comes over between the temperatures of 25° and 40°. It will consist chiefly of pentane, together with small quantities of lower and higher homologues whose presence does not affect the light of the lamp.

GAS CALORIMETER.

The gas calorimeter, which has been designed by Mr. Boys, is shown in vertical section. It consists of three parts, which may be separated, or which, if in position, may be turned relatively to one another about their common axis. The parts are: (1) The base A, carrying a pair of burners B, and a regulating-tap. *The burners are made of steatite; and they are carried upon a head and tube V, also made of steatite, and circular in cross section.* The upper surface of the base is covered with a bright metal plate held in place by three centring and lifting blocks C. *The centre of this plate is perforated, and carries a ferrule W, over which is slipped a tube of fibre X, as shown. A recess 6 inches diameter and ¾-inch deep is turned out of the base, and a disc of felt Y, 5½ inches diameter and ⅜-inch thick, and perforated in the centre, is fastened centrally in the recess. Six ½-inch holes Z are drilled from the corner of the recess to the groove in the base.* The blocks are so placed as to carry (2) the vessel D, which must rest upon the horizontal portion of the blocks, and not upon their upturned ends. This vessel is provided with a central copper chimney E and a condensed water outlet F. It is jacketed with felt R, protected by a sheet of metal S. The diameter of the chimney E at the base is 3½ inches, and at the top 2½ inches, and its thickness $\frac{1}{10}$ inch. The base of the outer vessel is preferably spun in one piece with the chimney, as shown in the drawing. In order to prevent obstruction of the flow of condensed water from the outlet F by the accidental contact of the thin brass protecting wall of the pipe system, a small dimple is punched in the outer casing on either side of the outlet F, so as to project inwardly about $\frac{1}{16}$ inch. Resting on the rim of the vessel D are (3) the water circulating system of the calorimeter attached to the lid G. Beginning at the centre where the outflow is situated, there is a brass box H, which acts as a temperature equalizing chamber for the outlet water. Two dished plates of thin brass K K are held in place by three scrolls of thin brass L L L. These are simply strips bent round like unwound clock springs, so as to guide the water in a spiral direction inwards, then outwards, and then inwards again to the outlet. The lower or pendant portion of the box is kept cool by circulating water, the channel for which may be made in the solid metal, as shown on the right side, or by sweating on a tube, as shown on the left. Connected to the water-channel at the lowest point by a union are five or six turns of copper pipe, such as is used in a motor-car radiator of the kind known as Clarkson's. In this a helix of copper wire threaded with copper wire is wound round the tube, and the whole is sweated together by emersion in a bath of melted solder. A second coil of pipe of similar construction surrounding the first is fastened to it at the lower end by a union. This terminates at the upper end in a block, to which the inlet-water box and the thermometer holder are secured by a union, as

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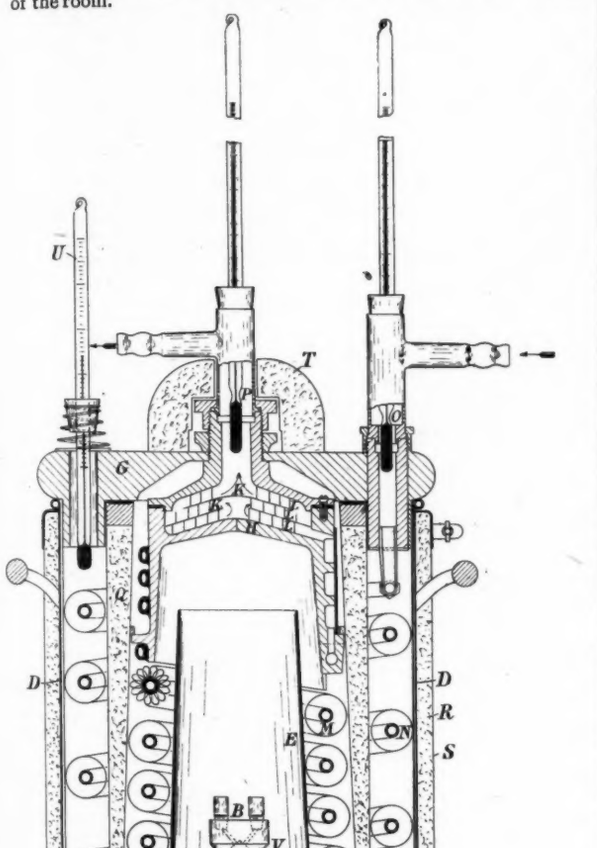
* *If preferred a smaller proportion, say* $\frac{1}{n}$*th part of the liquid may be taken for the determination, in which case the number of grains of barium sulphate obtained must be multiplied by* 2·29*n, instead of being multiplied by* 4·58.

† An equally good and more expeditious method is to drop the filter with its contents, drained but not dried, into the red-hot crucible.

‡ 233·5 *grains of barium sulphate are formed from* 32·1 *grains of sulphur; w grains of barium sulphate have been obtained from* 5 *cubic feet of gas. Hence in* 100 *cubic feet of gas there are* $\frac{32{\cdot}1}{233{\cdot}5} \times \frac{100}{3} = 4{\cdot}58\ w$ *grains of sulphur.*

shown at O. An outlet-water box P and the thermometer holder are similarly secured above the equalizing chamber H. The lowest turns of the two coils M N are immersed in the water, which in the first instance is put in the vessel D.

Between the outer and inner coils M N is placed a brattice Q made of thin sheet brass, containing cork-dust to act as a heat insulator. The upper annular space in the brattice is closed by a wooden ring, and that end is immersed in melted rosin and beeswax cement, to protect it from any moisture which might condense upon it. The brattice is carried by an internal flange which rests upon the lower edge of the casting H. A cylindrical wall of thin sheet brass, a very little smaller than the vessel D, is secured to the lid, so that when the instrument is lifted out of the vessel and placed upon the table, the coils are protected from injury. The narrow air-space between this and the vessel D also serves to prevent interchange of heat between the calorimeter and the air of the room.



Tho Boys Calorimeter.

The two thermometers for reading the water temperatures and a third (U) for reading the temperature of the effluent gases are all near together and at the same level. *The thermometer U for finding the temperature of the effluent gases is divided on the Fahrenheit scale.* It is supported (as shown) by means of a cork and an open spiral of wires, so that the bulb is a short way above the circulating coil, and with its stem passing through one of the five holes provided for the effluent gases. The lid may be turned round into any position relatively to the gas-inlet and condensed water drip that may be convenient for observation, and the inlet and outlet water boxes may themselves be turned so that their branch tubes point in any direction. A wood shield T, made in two halves, serves to protect the outlet-water box from loss of heat.

A regular supply of water is maintained by connecting one of the two outer pipes of the overflow funnel to a small tap over the sink. The overflow funnel is fastened to the wall about 1 metre above the sink; and the other outer pipe is connected to a tube in which there is a diaphragm with a hole about 2·3 mm. in diameter. The tube is connected to the inlet-pipe of the calorimeter. A piece of stiff rubber pipe, long enough to carry the outflow water clear of the calorimeter is slipped on to the outflow branch, and the water is turned on so that a little escapes by the middle pipe of the overflow funnel, and is led by a third piece of tube into the sink. The amount of water that passes through the calorimeter in four minutes should be sufficient to fill the graduated vessel to some point above the lowest division, but insufficient in five minutes to come above the highest division. If this is not found to be the case, a moderate lowering of the overflow funnel or reaming-out of the hole in the diaphragm will make it so. The overflow funnel should be provided with a lid to keep out dust. The graduated vessel shall have been previously examined and certified by the Gas Referees.

The thermometers for reading the temperature of the inlet and outlet water should be divided on the Centigrade scale into tenths of a degree; and they should be provided with reading lenses and pointers that will slide upon them. The thermometers are held in place by corks (not india-rubber), making an air-tight fit within the inlet and outlet water boxes. Care must be taken that the bulbs are fully immersed, as shown. The positions of these thermometers should be interchanged every month, and also before the second testing when a second testing is made on any day in accordance with section 4 (1) (*b*) of the Gas Light and Coke Company's Act, 1914. The thermometers for the hygrometer and for reading the temperature of the effluent gases should be divided on the Fahrenheit scale into degrees. The thermometers used in the testings must bear a distinctive number, which will be recorded on a certificate of correctness issued by the Gas Referees; and no thermometer shall be used in the testings which has not been certified by them.

The flow of air to the burners is determined by the degree to which the passage is restricted at the inlet and at the outlet *and at the base of the brattice.* The blocks C which determine the restriction at the inlet are made of metal $\frac{1}{16}$ inch or about 5 millimetres thick; while the holes round the lid which determine the restriction at the outlet are five in number, and are $\frac{5}{8}$ inch or 16 millimetres in diameter.

The calorimeter should stand on a table by the side of a sink, so that the condensed water and hot water outlets overhang and deliver into the sink. A suitable change-over funnel is shown [in the "Notification"]. A piece of india-rubber tube reaching nearly to the base should be attached to the waste-water pipe so as to avoid splashing,* and another piece may conveniently be slipped on to the condensed water outlet so as to lead the condensed water into a flask; but care should be taken that the small side hole is not covered by the tube. *A vessel* must be provided of the size of the vessel D containing water in which is dissolved sufficient carbonate of soda to make it definitely alkaline. The calorimeter after use is to be lifted out of its vessel D and placed in the alkaline solution, and there left until it is again required for use. The liquid should not, when the calorimeter is placed in it, come within 2 inches of the top of the vessel. The liquid must be replenished from time to time, and its alkalinity maintained.

The ventilated wet and dry bulb hygrometer is also shown [in the "Notification"]. The main ventilating system consists of a single piece of glass of the shape and dimensions shown in the figure. This stands upon a metal base which, by means of a glass tube, carries a single rat-tail burner adapted to make a flame about 1½ inches high. The air to supply the burner and chimney is drawn in through the two holes opposite the thermometer bulbs, one of which is covered with cotton and connected by means of wick with the water in the cup immediately below. The glass tube fits easily over the stem of the metal base, which is covered with cloth or other soft material to prevent injury to the glass. The upper or chimney part of the *wide tube* may be made of metal fitting over a shorter glass tube; but the flame should in no case be obscured from view. The thermometers are divided into degrees on the Fahrenheit scale. Distilled water is to be used in the cup under the wet bulb.

Calorific Value of Gas.

In a form with example of calculation of the calorific value of gas, the line appears: "Time of four revolutions of meter hand, 4 min. 54 sec. [instead of 4 min. 24 sec., as before].

* As damage to the outlet thermometer or the calorimeter has in some cases been caused by the turning off of the water supply, it may be well to suggest a method of meeting this difficulty. The waste water from the change-over funnel may be led into a small vessel from the bottom of which the water can escape, but at a rate less than that of supply. This vessel may be counterbalanced by a weight or spring so that when empty it rises a small distance and acting as a trigger allows a weight to fall or a wound-up alarum to ring, thus attracting the attention of the gas examiner.

An Enemy Trading Committee.—The Board of Trade have appointed Mr. Ernest R. Moon, C.B., K.C. (Chairman), the Hon. John D. FitzGerald, K.C., Sir George Croydon Marks, M.P., and Mr. Gershom Stewart, M.P., to be a Committee to advise them on matters arising under the Trading with the Enemy Amendment Act, 1916. The Committee Secretary is Mr. W. P. Bowyer.

"Bacterized Peat."—The Manchester City Council have accepted a proposal made by the Cleansing Committee to undertake an experiment in the manufacture of "bacterized peat" or "humogen," in accordance with a plan drawn up by Professor Bottomley. A sum of £400 or £500 will, it is anticipated, meet the cost of the experiments; and as the Committee possess 130 acres of raw peat, the material necessary is at hand. It is hoped that, when treated, the Corporation will be able to sell the peat at a good profit. Professor Bottomley has declared he has no intention of exploiting his discovery at the expense of the nation.

PROCESS FOR TREATING AMMONIACAL LIQUOR.

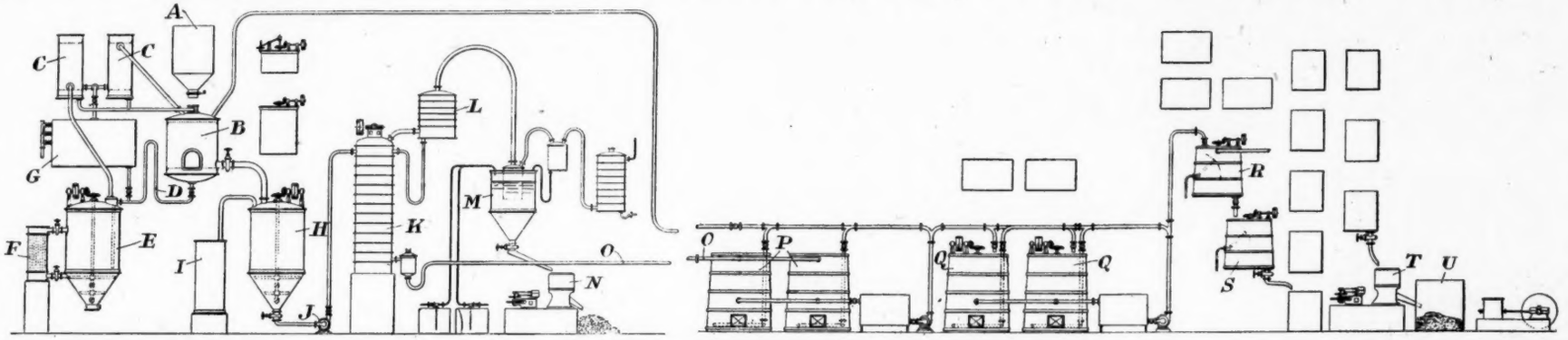
A French Patent.

A method has recently been patented in France for the extraction of ammonia, sulphur, and prussian blue from gas liquor according to which the inventors, MM. Bonneau and Hasenfratz, first evaporate the liquor, and then extract the sulphur from the residual mass. The residue from the latter process, together with the distillate from the first operation, is next treated with lime for the removal of the ammonia, and the portion then left is further treated with chloride of potassium for conversion of the cyanide compounds into double ferrocyanide of calcium and potassium, which latter is first decomposed by carbonate of soda and then converted into prussian blue with an iron salt. The "Journal des Usines à Gaz," in publishing the following description of the plant in its Jan. 20 issue, is careful to point out that it is without information allowing it to confirm the epithet "perfect" employed with regard to the process in the patent specification.

The crude liquor is first evaporated in a steam-jacketed cylindrical chamber, from which the water and free ammonia are drawn off and condensed in a coil. The desiccated mass is treated in a diffuser-extractor with trichlorethylene at a raised temperature, yielding a warm saturated solution of sulphur. On cooling, a large part of the sulphur separates out, while the cold solution can be distilled and the condensed solvent used for a fresh operation. In the drawing, the hopper for the dried mass is shown at A; and B is the diffuser-extractor to which the heated solvent is supplied from the condensers C. The saturated fluid passes by the syphon D to the reservoir E, where it is distilled off by steam heat from F and condensed at C—this cycle of operations proceeding continuously. When the whole of the sulphur has been extracted, the passage of the condensed distillate from C is diverted to G, and a fresh lot of residue treated by first running off the exhausted material as a sludge (by admixture with water) into the receptacle H, where it is mixed by means of revolving paddles, and any solvent distilled off by direct steam into a condenser I. Milk of lime is then admitted into H, and the mixture heated to boiling. This distills off part of the ammonia, and converts the iron ferrocyanide compounds into soluble calcium ferrocyanide. The boiling mixture is forced by the pump J to the distillation column K, where the remainder of the ammonia is discharged from the liquor. It traverses the check column L and passes into the sulphuric acid vat M, whence it is discharged to the hydro-extractor N, and is finally collected for delivery.

The exhausted liquor from K, containing the ferrocyanide in solution, is run off by the pipe O to a couple of tanks P, in which it is allowed to settle. Thence it is pumped into a similar pair of tanks Q, provided with mixing paddles and steam-heated, and is here treated at a boiling heat with chloride of potassium, yielding the insoluble double ferrocyanide of calcium and potassium. This settles out, the clear liquor is run off, and the precipitate treated with soda carbonate, which throws down a sludge of carbonate of lime and leaves a liquor of soluble ferrocyanides.

The last stage is to pump this liquor from the second pair of tanks to one R, in which addition is made first of sulphuric acid, until the mixture is acid, and then of sulphate of iron dissolved in boiling water. The white ferrous ferrocyanide thus formed flows by gravity to a further tank S, in which its conversion into prussian blue is carried out with soda hypochlorite. The final product is washed several times by decantation, dried on a hydro-extractor T, and eventually *in vacuo* in the tank U.



THE ORIGIN OF COAL.

A review of investigations and theories on the origin of coal has been given by Rosenthal in recent numbers of "Braunkohle." A summary of his communication appeared in the "Journal für Gasbeleuchtung for the 5th inst.

As early as 1778 Beroldingen pointed out that a relationship subsisted between peat, lignite, and coal, and that lignite might be produced from peat, and coal from lignite. Peat, he considered, might be formed by the submersion of vegetation. Potonié drew a distinction between combustible and incombustible mineral matter and subdivided the former, which he termed caustobiolith, into three groups—viz., sapropelite, mineral humus, and liptobiolith. It followed from his classification that a coal could never be formed from the tertiary lignite which would be exactly the same as the carboniferous pit coal. Chemically, according to Liebig, coal is formed slowly from vegetable matter, either in the moist state with unchecked access of air, or with exclusion of air, or in contact under water with decaying organic matter. The distinctions indicated are, however, not recognized at present.

The external conditions which lead to the formation of coal are: Temperature, pressure, and lapse of time. The greater the lapse of time and the greater the pressure the higher is the content of carbon in the coal. In attempting to imitate the process of coal formation in the laboratory, it has commonly been overlooked that the decomposition of cellulose is an exothermic process, and that the considerable rise of temperature which thereby results generally causes a partial carbonization of the coal formed. Bergius, in his investigations, controlled the temperature by using liquid water in conditions analogous to the natural ones, and at the same time attained a sufficient velocity of the reaction. The coal which he produced from peat and cellulose corresponded closely in composition with natural bituminous coal, but showed certain differences in its external characteristics. By increasing the pressure, however, it was found possible to produce coal which externally resembled natural pit coal.

Condensed carbonic acid has been found in Lower Silesian coal pits. The chemical composition of the gases enclosed in Lower Silesian coal has been stated by J. Meyer, who has observed that the coal of the seams from which carbonic acid is evolved has an anthracitic character. The carbonic acid in the Silesian pits actually occurs in three conditions—viz.: (1) It is evolved from subterranean wells saturated with it; (2) it is enclosed in the compressed state in pockets in the coal itself; and (3) the coal contains absorbed carbonic acid which escapes when the coal is broken up. Meyer considers that the carbonic acid may result from the coal formation process, especially as Bergius observed its occurrence in his experiments on the decomposition of cellulose. But carbonic acid may also be produced by the action of superheated liquid water on coal which is already formed. Such conditions would occur when hot mineral matter was brought by eruption into intimate contact with wet coal.

SIXTY YEARS AGO.

From the "Journal" for Feb. 19, 1856.

A Provident Institution for Gas Engineers.—A valued correspondent suggested in our last number that it would be desirable to establish an institution for the purpose of relieving the distress of decayed members of the profession. Unfortunately, the number of instances which have come under our notice of the necessity for some such institution is so great that we feel it our duty to call the serious attention of our colleagues to the question. There are benefit societies among those whom it is the fashion to call the working classes, not only of engineers, but of almost every other trade. Travellers, licensed victuallers, artists, literary men, and actors have very wisely and very charitably combined together to relieve the wants of those of their numbers whom age, or suffering, or "the thousand ills that flesh is heir to," have deprived of the means of supporting themselves. It is strange that engineers should not, in their turn, have felt it necessary to adopt some such measure long ere now, especially as the nature of the pursuit is one which is not only dangerous from its exposure to accident, but also on account of the fearful manner in which it taxes the mental and physical powers of its followers. We can assure our readers that we shall be anxious to co-operate in any attempt to remove what we consider to be somewhat of the nature of a reproach to our profession; and we earnestly invite suggestions upon the subject. Very recently it has been necessary to make an appeal (in favour of a worthy but reduced engineer) which has been nobly responded to; but it must evidently be preferable to found some permanent institution than to be thus compelled to depend on the casual beneficence of men often hard pressed themselves to maintain their own positions in society—particularly in these days of small salaries for professional men.

Corporations as Trustees.—We are happy to observe that the general body of the Liverpool Town Council have arrived at fairer conclusions with respect to the controversy lately raised between the Sub-Committee and the Gas Company of their town, than the members of the same Committee appear to have done. By a very considerable majority, the extravagantly absurd scheme of confiscating the property of the Company was rejected; and the Town Council have contented themselves with calling for the nomination of an inspector of meters, and giving instructions to the borough engineer to attend to the testing of the gas. This was as it ought to have been done; and the most prominent leaders of the movement by which the proceedings of the Gas Committee were set aside adopted the style of argument we have always adopted upon this subject. Corporations never can manufacture as cheaply as individuals directly interested in the economical results of the operations required; and Mr. Holme was perfectly justified in saying that, if the Liverpool Corporation took the manufacture of gas into their own hands, the price of that article would probably not be diminished. That gentleman also advanced a principle which we believe to be essentially true —"that corporations had no right to be traders; they were trustees;" and we have had too many occasions of late to protest against the tendency of the municipalities, especially in the North of England, to overlook this very important, and almost self-evident, truth in political economy. At present the Town Council of Liverpool do not seem likely to be easily induced to imitate the errors of their neighbours.

A Rotary Gas-Making Machine.

In an issue of the Nanaimo (Vancouver Island) "Free Press" published early last month, there appeared a long and graphic article, the writer of which essays to show how a "Local Invention Puts the Island on a Natural Gas Basis." The picture that is drawn of what a natural gas basis means is an alluring one indeed; and an invention that succeeded in bringing about the realizatien of this golden dream would more than deserve all the good things that could be said of it. We learn that it is to be brought about by a new rotary gas-making machine, the invention of Mr. Walter Thomas, which is intended to utilize the vast quantities of mine refuse which exist within a few miles of the radius of Nanaimo. Being gas fired, it does away with the necessity for coke for heating; and it is claimed that "its rotary motion constantly altering the relation of the particles of coal to the hot retort and to each other, distils the gases in such a diabolically short space of time that the thing seems uncanny." Having, too, an automatic feed and discharging itself, "cuts the labour bill to such an extent that the labour cost of about 20 c. per 1000 cubic feet in the ordinary gas-works would be cut to about 3 c. with the rotary gas-making machine. The rotary motion of the retort, together with the fact that it "is heated by the cheap gas made from the refuse from the gas making or direct from low-grade fuel by a well-known method (a different operation from the old-fashioned gas-producer), makes the rotary gas-making machine," it is claimed, "the one machine in the world to handle the immense quantities of low-grade fuel" which surround Nanaimo, Vancouver Island. May the invention achieve all the success thus anticipated! The proposal brings back to mind the Yeadon and Adgie revolving retort which was experimented with in this country twenty and more years ago.

SCOTTISH JUNIOR GAS ASSOCIATION.

(WESTERN DISTRICT.)

A Meeting of the Association was held in the Royal Technical College, Glasgow, on Saturday last—Mr. DAVID FULTON (the President) in the chair.

At the outset, the interim HON. SECRETARY (Mr. Malcolm Littlejohn) intimated that Mr. Fulton had been awarded the medal for the best paper read last session. It had been decided to advance the date of the general meeting to April 1.

Two papers were read at the meeting—one on "Coke Handling and Carbonization," by Mr. C. Dickson, of Kirkintilloch; the other, "Notes on Purification," by Mr. W. Bennett, of Greenock. These will be found on pp. 417 and 419. Discussion was limited to Mr. Dickson's paper; it being agreed, on the suggestion of Mr. G. T. Purves, that it would be advisable to postpone the discussion on that by Mr. Bennett until the paper had been further studied. Mr. Bennett's contribution will therefore be discussed on the occasion of the visit of the Association to the Kilmarnock Gas-Works on the 18th prox.

PROFESSOR H. E. ARMSTRONG ON THE COAL PROBLEM.

Addressing the members of the Newcastle Section of the Society of Chemical Industry, at a meeting held in the lecture theatre of the North of England Mining Institute at Newcastle last Wednesday, Professor HENRY E. ARMSTRONG, F.R.S., dealt with the subject of "The Problems of Coal, with Reference to the Complete and Provident Utilization of the Supplies and of Fuels Generally: Preliminary Discussion and Scheme." Mr. CHARLES CARPENTER, D.Sc., the Chairman of the South Metropolitan Gas Company, who is President of the Society, was in the chair.

SQUANDERING NATURAL RESOURCES.

Professor Armstrong stated that everyone was aware that we wasted coal profusely and that it was fast going up in price. As we now burnt approximately 200 million tons per annum, it was unnecessary to dwell upon the fact that, if we could double the efficiency of our methods of using fuel, we should be able to keep much money in our purse. There was a spirit of altruism growing up gradually which was leading us to think that we must take effective steps to check the thoughtless squandering of natural resources which had been a dominant characteristic of civilization of late years—not of fuel alone, but of raw materials generally. The primary political issue in connection with coal to be considered some day in the not distant future would be as to the ownership of our national fuel supplies. We should be prepared to deal with this grave problem in an absolutely philosophic and scientific manner, without tinge of political feeling. The question of exporting coal should receive more immediate attention.

Present methods of coal getting were far from being perfect, and much was left underground that would never be recovered. Should not the delivery of all coal at the surface, not merely of that which is easily won, be made obligatory? At least, it would seem to be desirable in such an industry to pool intelligence and work all mines efficiently. Under a system of uncontrolled private ownership, this was not likely to happen. Methods of cleaning coal satisfactorily should be developed. Apparently, there was much to be done in this direction, especially in the case of the poorer fuels. The utilization of minerals associated with coal would need consideration. In view of the growing demand for sulphur, it might be desirable, in certain cases, even to separate pyrites—a far less difficult task than formerly, in view of the introduction of effective methods of concentrating heavy minerals—by levigation in water, with the aid of oily substances, such as were used at the Broken Hill mines and elsewhere in dealing with zinc and other ores. The question of the ventilation of mines played an all-important part, both as affecting the health of the miners, the depth to which the workings could be carried, and the prevention of explosions. The measures taken hitherto had been little short of perfunctory; and a far more representative body of workers should be engaged without delay to prosecute inquiry. The question of the constant control, by chemical means especially, of the state of ventilation in mines called for immediate attention. He was informed that enough was known to make such control really effective, if properly conducted by persons who understood the work.

BYE-PRODUCTS RECOVERY.

In burning coal in the ordinary way, either in raising power or for domestic purposes, not only was an unsatisfactory modicum of the heat energy utilized, but everything else was sacrificed. Little short of 20 million tons of coal were carbonized annually by the gas industry, and at least an equal quantity was coked for the iron and steel industry. The volatile products had long been saved by the gas industry; but it was only quite recently that any considerable development of bye-product recovery coking plant had been effected. Now, however, fully two-thirds of the coal used in making blast-furnace coke was produced in recovery ovens of various types; and it was to be expected that the bee-

hive oven would soon pass into oblivion—if not spontaneously, by public enactment. It was essential to recognize that coal now counted not only as a fuel but in sundry other ways—in agriculture, on account of the ammonia; in gold mining, as not a little cyanide was prepared from gas liquors; in the dye-stuff industry; as a source of sulphur; and as affording liquid fuel for internal combustion engines. At the moment, most of the material used formerly in the dye-stuff industry was being diverted to the manufacture of explosives; in addition, for the same purpose, coal gas was being stripped of vaporous constituents from which much of its value was derived.

At most, about 20 per cent. of the coal we consumed was so used that the volatile products were recovered. Ammonia made in Germany in factories by the direct interaction of nitrogen and hydrogen, was fast coming into competition with the natural product; and it might well happen that the victory gained over Nature in the case of madder-red and indigo-blue would be repeated in the case of ammonia. It seemed little short of criminal that we should be talking of making ammonia and nitric acid by synthetic methods. The same argument might be applied to the sulphur in coal—at least 400,000 tons of which were not only wasted but forced into the atmosphere to pollute it.

Domestic Users and "Raw" Coal.

The question he desired to raise was whether drastic action should not be taken to put an end to much of the waste involved in burning raw coal—at all events, in the case of that consumed by domestic users. He urged the Society to advocate an enactment forbidding the use of raw coal for domestic purposes, such enactment to come into force at latest about ten years hence. He did not believe that hard coke such as was now produced could ever be a satisfactory domestic fuel. A softer form—of the Coalite type—seemed to be required. Such a conclusion, if accepted, would have most important consequences. It would involve the complete reconstruction of the gas industry, as that industry would have cast upon it the double function of providing a suitable solid fuel as well as a suitable gaseous fuel. The whole question of power centres, possibly of heat-distributing centres also, must be taken into consideration.

Advice to the Gas Industry.

The gas industry was rapidly approaching a second period of crisis. The battle between electric and gas light must soon be fought to a finish. The advantage the electric light had over gas light for domestic use was unquestionable; and the former must prevail in the end. Might it not be to the advantage of the gas industry that this should be recognized at an early date, and the mains set free for the supply of heating and power gas? The rare materials used in making Auer mantles would not always be forthcoming. Unless certain changes in gas were made at an early date, users would be driven into the arms of the purveyor of electric light. Gas must be both cheapened in price and improved in quality. The price, except in towns such as Sheffield and Widnes, was altogether disproportionate to value. This was because the capital locked up in the industry was excessive. The industry must be conducted to afford larger profits, comparable with those made in the other chemical industries—for it was a chemical industry, though hitherto it had been all but entirely in the hands of men who knew not chemistry.

A disastrous step was taken by gas managers a few years ago when they secured the repeal of the sulphur clauses. Since then, our homes had been flooded with sulphurous fumes, and we had suffered not a little in consequence, though most users of gas were too ignorant to appreciate the effects, and many gas engineers probably were not alive to the nature of the policy that they had accepted. Nothing, to his mind, had been more satisfactory, in late years, than the action that was taken by the technical staff of the South Metropolitan Gas Company, in recognizing the moral obligation that was cast upon the industry when thus granted free trade in sulphur. The patience and ability displayed by an unassuming trinity at Greenwich in developing a successful process of removing all but traces of sulphur compounds from gas was worthy to rank with the best German chemical work. Seven years were spent in working out the process and in carrying it into practice on a large scale. The inquiry was promoted by their President (Mr. Charles Carpenter); but he had assigned the credit for the chemical and physical foundation of the process to the Chief Chemist of the Company (Mr. Evans), who, with Mr. Franks, one of the younger engineers, was also mainly responsible for translating the process to the large-scale plants. The invention and elaboration of such a process in their gas-works marked the opening of a new era—that of science—in the industry. Science had in the past been strangely neglected by gas engineers and boards of directors throughout the country. In view of the many problems awaiting solution, which must be solved at no distant date, it was hoped that the example set by the South Metropolitan Gas Company in maintaining a highly competent scientific staff would not be lost on the country.

Now that an efficient process was available, the force of public opinion should compel all gas companies once more to concern themselves with the removal of sulphur. It was the policy of gas managers in the past to encourage the waste of gas and to pay little attention to quality beyond that required to satisfy statutory obligations. A few enlightened undertakings now saw the folly of such a policy; and it must be expected that, when they were once more free to attend properly to public interests, they would seek to supply an article of standard quality calculated to satisfy requirements, and thus set an example which must be followed. In no other way would the gas industry be likely to maintain its position.

Scientific Inquiry into the Fuel Problem.

As to the production of the solid fuel suitable for general use, and a sufficiency of gaseous fuel, the lecturer's proposal involved a thorough experimental inquiry to determine the conditions best suited to produce coke that would give satisfaction in practice, in the first place, to domestic users, though he contemplated the extension of the practice to all bituminous coals. The inquiry would be too costly, extensive, and problematic to be carried out privately, nor should it be done at the expense of the country at large. Therefore, he suggested that the Society, which was not only a body of coal users but the only body that could understand all the problems involved in the use of fuels, should memorialize the Government to place a tax upon all the coal raised, and that the funds so obtained should be expended, under the competent direction of persons appointed by the Society, in developing suitable methods so as to conserve, as far as possible, all valuable educts, and, at the same time, produce solid and gaseous fuels that were suited to public use. The inquiry should be extended in every necessary direction, and should involve also the discussion of all questions of policy relating to coal and its uses—in other words, the study of fuel problems in general. The services must be enlisted of all the men in the country who were really competent to take actual part in, and have responsible charge of and direct, such an inquiry; and they must be properly paid for their services.

It was essential that action should be taken at an early date in direct protection of public interests—as it was not unlikely that money would ere long be asked for for soft-coke undertakings. It was the duty of the Society to come forward in protection of the public against the company promoter in this particular instance. In self-protection, scientific workers must, in future, intervene to prevent the public being misled by interested expert opinion. It might be argued that such action would tend to prevent the flow of capital; it was, however, certain to check evaporation of capital.

Professor Armstrong then dealt with the attempts made hitherto to produce soft coke and to utilize the bye-products properly, and said these had not always been in competent hands. It was most unfortunate that proper advantage had never been taken of the opportunities afforded by the various vain attempts made of late years to develop low-temperature coking as a commercial enterprise. He was satisfied that the attempts had never been made under proper conditions. He quoted, as "the one luminous contribution to the subject," that made by Dr. Beilby to the British Association meeting in Birmingham in 1913.*

One inquiry of special importance would involve a complete geological and chemical survey of our coals, to determine as far as possible their composition and the distribution and extent of the different varieties. It might be desirable to set aside some varieties and confine their use to certain special purposes—the Durham coal, for example, as a coking coal. An inquiry into the use of fuels must also be carried out. The waste, due to ignorance on the part of users, was enormous. The provision of efficient heating appliances, whether for gaseous, liquid, or solid fuel, should be made the subject of profound study. The economical use of fuels in our industries should be discussed. Not only was it necessary to discuss the various appliances—like water softeners, heat economizers, mechanical stoking machinery, boilers, &c.—but also broader questions—*e.g.*, the distribution of the load factor in works, not omitting that of co-operative systems of producing power. Full discussions of gas-producers and their efficiency, as well as of the methods of using liquid fuel, were of immediate importance. In fact, no question bearing on the production and provident use of fuels must be left out of consideration.

Work for a National Fuel Board.

It would probably be necessary to establish a Central National Fuel Board and Secondary Boards to control certain specified areas. Coal would no longer be used as such, but would be delivered at selected centres and there prepared to serve as fuel—everything being separated from it that could be put to higher use. The gas produced in the coking process would be raised to the necessary volume by dilution with producer gas and supplied separately. The gas-works as we now knew them should disappear, and their place be taken by the fuel and power works. Great engineering problems would arise under such a scheme, including the distribution of gas, probably under pressure, over long distances. The industry at large and the use of fuel should be brought absolutely under scientific control. To this end, it would be necessary to establish one or more central laboratories at which the major problems could be studied.

Probably, in the near future, the coking industry, as well as the gas industry, would be closely linked with manufacturing industries, especially with that of organic chemicals, including dye-stuffs. It would probably be desirable at some works to produce intermediate products from the raw materials separated during the coking process, as the sole value of these raw materials, when very large quantities were produced, might in some cases be so low that a remunerative return would not be obtainable in any other

* See "Journal," Vol. CXXIII, p. 838.

way. It appeared already desirable that those who had bye-product recovery coking plants should co-operate from this point of view, and, without further delay, should establish a central research department to serve the special purposes of the industry. He commended his proposals to the careful consideration of all sections of the Society, asking not only for immediate consideration but for little short of instant action.

DISCUSSION.

The PRESIDENT said that they were having the severest lesson possible that the individualism to which they had been so accustomed, and upon which they had so largely prided themselves, had proved an insecure reed. The question raised by Professor Armstrong was how far, in what direction, and by what steps, organization could be applied to the coal industry. He was sure that, in such a meeting, formed of so many experts in various branches of the coal industry, help would be given in devising means to deal with a problem concerning which there was no possible doubt that serious action would have to be taken.

Dr. DUNN, the City Analyst for Newcastle, said he had had the opportunity of examining a good many of the low-temperature processes for the distillation of coal, and had found the state of things to which Professor Armstrong had so luminously drawn attention. He thought that there was an enormous future for a smokeless fuel, of the nature of coalite—using the term "coalite" to signify the coke produced from any system of low-temperature distillation. There was an enormous field for such coke as domestic fuel. In one small experimental works in London, where smokeless fuel was being produced, the whole of the output was taken by coal merchants, who were, indeed, prepared to take any additional quantity the works could produce. This smokeless fuel was being paid for by consumers at a rate considerably in advance of the price in London of good household coal. With a view to testing the suitability of such product for domestic fires, he recently had a ton of it sent from London to his own house. They all knew how conservative the domestic servant was; but, after a month's use of the ton of soft coke, his cook was disconsolate at not being able to procure any more. It entailed less labour, there was no cleaning of flues necessary, and it was more under control and better in every way than coal. The difficulty in regard to these processes was that most of them had been carried out by people with very little capital and technical knowledge. He had come across four or five such processes, each exhibiting some point of advantage. If instead of this individual experimentation by people ignorant of one another's work, there were some central body to which people could apply and bring their devices, he had no doubt very valuable results would be obtained.

Mr. W. DIAMOND, the Manager of the coke-ovens at Messrs. John Bowes and Partners' Marley Hill Colliery, stated that the chief effort in the coke industry was to produce coke of good metallurgical quality. When patent ovens first came out, the furnace people greatly objected to the soft, dark, and dirty coke produced; but they were coming round, and showed great appreciation of these bye-product ovens. So far as coke produced by low-temperature distillation was concerned, when the first ovens were started there were no great heats. If they got anything like 900°, taking 50 to 55 hours carbonizing, it certainly produced a very dense coke, and also a more fluid tar than at present. But while they now obtained higher temperatures in the more recent ovens, they also got a very thick tar, full of naphthalene and pitch. In the old days, they used to get a very nice, fine, thin tar, and obtained very good benzene, phenols, &c., out of it. If they had low-temperature carbonizing again, they should get that better quality of tar—probably not so much ammonia, but they would again have a greater outlet for the fuel. If individual effort could be collected and put into a Board of Control, the results might be very valuable.

Mr. THOMAS HARDIE, the Engineer of the Newcastle and Gateshead Gas Company, said that, while it was true that the low-temperature process of coal carbonization might have a future, it certainly had also had a past; and that past had not shown that carbonization could be made a commercial success, even if it could be proved by scientific research that, by carbonizing coal in this way, it might be possible to produce from the bodies which it contained the greatest efficiency. To make any process a success at the present day, it must be commercially as well as technically and scientifically successful. So far as gas for fuel was concerned, he had not learned that it should be further purified from sulphur than at present. The movement which took place a few years ago was not, as might be supposed, a distinct departure from the practice of a great number of years. The restrictions were removed in a certain number of cases; but, as a matter of fact, the larger number of undertakings in this country had not been under any restrictions whatever, and it was perfectly well known what the conditions would be when the restrictions were removed from the others. If methods could be discovered whereby the fuel supplies could be controlled and coal used more economically it should be done, and if it resulted in disadvantage to the gas industry, that industry would have to stand it. He did not think that gas undertakings would be behind in altering their plants to meet any new successful system.

Dr. PATERSON, the Chief Chemist to Messrs. Swan, Hunter, and Wigham Richardson, Limited, of Wallsend, was of the opinion that, for household heating purposes, coal gas was very hard to beat. If a solid fuel was required, his experience was that one could take any type of coke refuse and add to it small proportions of the liquid substances obtained during distillation and make a perfectly satisfactory household fuel which was quite smokeless. As to the ownership of gas-works and coke-ovens, there was, probably, a great deal to be said for the nationalization of these industries; but there were difficulties in the way of nationalization of chemical and material knowledge which might almost be insuperable. One might not get the very best type of chemist or coal user to give his views. The best spur to action was the incentive to make money out of it; and if they took away this incentive, they took away the spur to usefulness.

Professor P. PHILLIPS BEDSON, of the Chair of Chemistry, Armstrong College, Newcastle, said that, in connection with the suggestion that coal should be taxed to provide money for research, this was already done in Westphalia. Gas there was used as a fuel for the production of steam, which was used for the generation of electricity, which, produced at different collieries, was pooled and distributed over the district. There was waste heat at Middlesbrough from many of the coke-oven and bye-product plants, which might be used to produce electricity, which itself might be pooled for the benefit of the district.

Mr. GERALD STONEY drew the speaker's attention to the coke-ovens of the Priestman Collieries, Limited, where the gas was run under boilers, and the power thus produced put into the general system of the Electric Supply Company, and also to other collieries where a similar thing was done.

Professor BEDSON retorted that he was quite familiar with the facts mentioned; but his point was that the community did not benefit.

A SPEAKER mentioned that the mixing of coke-oven gas and coal gas had been successful, from both scientific and commercial points of view, at Middlesbrough and at Leeds.

The PRESIDENT did not think that Sir George Livesey had any rooted objection to purifying from sulphur compounds other than the general dislike of being worried by chemists. He was fully alive to the disadvantages of the sulphur; and he (the speaker) remembered being told by him about a shelf in his house—the house was adjacent to the works—where the books went rotten because of the sulphur compounds found near the ceiling. Sir George spent a good deal of time and money in endeavouring to elucidate the problem, but eventually gave it up. Of late years, the great anxiety of large buyers of coal, certainly in the South, had not been to get coal which would pass the proper physical and chemical tests, but to get supplies at all.

Professor ARMSTRONG, replying to the discussion, said that his mind was entirely open as to the character of the fuel ultimately required. What he wanted was a full and complete inquiry into the whole question. Most severe remarks were made in financial circles against them and their profession because they did not come forward for the protection of the public; and the Society must do something if it was to be of any use at all.

Output of Coal in Germany.

The effect of the continuance of war conditions on the output of coal in Germany is shown by the statistics of the production for last year. The figures are given side by side with those for 1914 (which was also largely affected by the war conditions) and 1913. The figures represent thousands of metric tons.

	1915.		1914.		1913.
Coal	146,712	..	161,535	..	191,500
Brown coal or lignite.	88,370	..	83,947	..	87,100
Coke	26,359	..	27,325	..	32,100
Coal briquettes . .	6,392	..	5,949	..	5,800
Lignite briquettes. .	23,350	..	21,449	..	21,417

The production of brown coal or lignite has not suffered appreciably from the war conditions. The explanation offered is that, for industrial furnaces, brown coal briquettes are constantly growing in favour.

Structure of Coal-Measures Plants.

At the Royal Photographic Society last Tuesday, Dr. George H. Rodman, of Richmond, delivered a popular lecture on the manufacture of coal gas, illustrated by some fifty photographic lantern slides, showing operations and plant in the works of the Richmond Gas Company, and of the Croydon Gas Company, at Waddon. This discourse he supplemented by another dealing with the flora and fauna of the coal measures, or, rather, with their structure as shown by a remarkably fine series of photographs taken in the microscope. The lecturer exhibited on the screen photographs of fossil specimens of plants of the coal measures—such as the lepidodendra, lyginodendra, sigillaria, and coniferæ—and followed each with photo-micrographs of coal showing the structure and indicating in many cases the remarkable correspondence with plants of the same genus existing at the present time. In the case of the lepidodendra, the high-power photo-micrographs showed a structure of innumerable spore-cases and spores, rich in resinous material, and indicating the burning qualities of the coal. Dr. Rodman is an expert microscopist; and no doubt the technical difficulties of the work have interested him as much as the evidence the results supply of the materials and processes concerned in the formation of coal. It is hardly possible, however, to imagine finer photographs of coal structure as seen under the microscope than those shown by the lecturer in illustration of his subject.

BENZOL PRODUCTION IN AMERICAN COKE-OVEN PLANTS.

The United States Geological Press Survey Bulletin, No. 254, contained an article to the following effect.

In response to the demand for high explosives, a new industry, the recovery of benzol and toluol, suddenly sprang into existence in the United States in 1915. Before the European War the demand in the United States for these products was so small that but one company engaged in coke-making sought to recover them on a large scale. Late in 1914 the price of benzol and toluol rose to such a point that other companies built plants to recover these oils from the gas; and by the end of 1915 there were nineteen new plants for benzol recovery in operation and others in course of erection.

Reports to the United States Geological Survey, by bye-product coke plants, indicate that the output of benzol and other light oils in 1915 amounted to 13,942,763 gallons, in connection with which there were produced 761,256 lbs. of naphthalene. Several of the plants are not equipped to separate the different oils found; and 7,322,670 gallons (more than half the total output) was crude benzol and light oil, and was shipped to refineries connected with powder works and other chemical industries. In the 6,620,093 gallons of oils refined at the place of recovery, there were 4,833,939 gallons of 100 per cent. benzol, 1,315,727 gallons of toluol, and 470,425 gallons of solvent naphtha. Thirty-one coke-making establishments with 4933 bye-product ovens contributed to this total; and it is estimated that between 8 million and 9 million tons of coal were carbonized to furnish the gas from which the oils were recovered. The annual capacity of the benzol-recovery plants now in operation is estimated at over 20 million gallons, and with the completion of the plants now building will probably exceed 22 million gallons. The value of these products is indicated by the prices currently reported during the year. Benzol, normally selling for 20 c. or less a gallon, in September brought as high as $1·25 for immediate shipment and 65 c. on contract; toluol, with a normal price of 25 c., was sold for as much as $6 a gallon for immediate delivery and was contracted for at $4·25 per gallon.

Benzol is an excellent motor fuel; but the United States with an output of gasoline estimated in 1914 at 30 to 50 million barrels (1500 million to 2500 million gallons), stands in no need of additional supplies for this purpose. There is, however, in normal times a large use for dyes and chemicals, such as carbolic acid, which depend upon benzol and toluol for raw material, and which have in the past been largely imported from Germany, either as finished or as intermediate products.

ENGLISH OIL SHALES.

Gauging the Contents of Horizontal Cylindrical Tanks.

A paper on "Oil Shales, with especial reference to those of the Dorsetshire Kimmeridge Series," was read by Mr. W. Hardy Manfield before a meeting of the Institution of Petroleum Technologists on Tuesday last. The chair was taken by Sir Boverton Redwood, Bart., F.I.C., Assoc.Inst.C.E.

The author reviewed the principal oil shales in the world, and proceeded to refer in detail to the deposits which occurred in England in the Kimmeridge shale in Dorsetshire. He traced the course of the Kimmeridge measures from Dorsetshire to Yorkshire, and gave a history (taken from a memoir by Burton Green) of the early efforts at working the Kimmeridge shales in Dorsetshire. He said that the natural gas at Heathfield in Sussex probably came from Kimmeridge shales. He had not heard why the Company which was formed to utilize this natural gas for lighting, heating, and power purposes did not accomplish more than it did; but possibly the bore-holes had been too close together. In addition to the outcrop on the coast near Kimmeridge, these shales have been proved to exist in considerable quantities at points further west—more especially at Ringstead and Portesham. They could, in the author's opinion, be best won by the "long wall" method of working; but in some places they might be worked by open-cast methods.

After describing briefly the development of methods of retorting shale in Scotland, Mr. Manfield expressed the view that many of the shales, especially of the lower grade, might be more profitably worked if the distillation were effected at lower temperatures. He said that experiments with Kimmeridge and other shales have shown that retorting at the lowest temperature that will distil the shale improved both the yield and the quality of the oil; but after the oil had been obtained, the temperature must necessarily be considerably raised, in order to get most of the ammonia. He then mentioned the Tarless Fuel Company's and the Del Monte methods of low-temperature working. The Kimmeridge shale in Dorset is rich in ammonia; the seam which gives the most oil yielding 45 lbs. of sulphate per ton of shale, while seams poorer in oil give more sulphate. The cost of the sulphuric acid necessary for converting the ammonia into sulphate might be saved if the sulphur were taken direct from the vapours. Probably this might be done by the Burkheiser process, as applied to coal gas, though there appeared to be an objection from the agriculturist's standpoint to any considerable proportion of the salt being in the form of sulphite instead of sulphate. It was the difficulty of removing the sulphur from Kimmeridge shale oil which had hitherto prevented the successful working of this shale. Oil from the best Kimmeridge shales distilled in the ordinary way contained from 5 to 8 per cent. of sulphur. The sulphur compounds in the oil were formed at a very low temperature, and when once formed were very difficult to destroy. Endeavours had been made to remove the sulphur from the shale itself, or to prevent its association with the oil; but the process followed was not commercially available. Drastic treatment of the oil was out of the question, as the sulphur compounds were more stable than its constituent hydrocarbons. Till a method of desulphurizing shale oil was devised, the vast resources represented by the Kimmeridge shales for the supply of motor spirit and fuel oil would not be available.

The discussion on the paper was opened by Mr. E. H. Cunningham Craig, who referred to the geological aspects of the Kimmeridge shale measures. Sir Thomas Holland attributed the success of the Scotch oil industry largely to its having had the benefit of Scotch persistence and skill. Professor J. Cadman congratulated the author on the exhaustive review he had given of the history of oil-shale working in Great Britain. Other speakers referred to the desulphurizing question being one for investigation by chemists. Mr. W. J. A. Butterfield hoped that, in view of the reference to Heathfield natural gas, the author would have also mentioned whether there was any connection between the Kimmeridge shale measures and the supplies of natural gas in Holland and Germany, which had lately been developed to a large extent near Hamburg, and now furnished about 15 per cent. of the gas supplied to that city. He first became acquainted with Kimmeridge shale about twelve years ago. In regard to the utilization of the sulphur in the shale for the manufacture of sulphate from the ammonia, it would be necessary, in order to employ the Burkheiser process, that the sulphur should be liberated in the form of sulphuretted hydrogen. He believed that a relatively small proportion of the sulphur in the oil vapours from Kimmeridge shale was in this form. In regard to the suggestion that the shale should be retorted at a low temperature for the liberation of the oil, and the temperature of the retort subsequently increased in order to obtain the maximum yield of ammonia, he would point out that if it were desirable to work at different temperatures with this end in view, the material should be passed from a retort at the low temperature to another retort at the higher temperature, as it would be technically uneconomical to delay operations in order to raise and lower the temperature of one and the same retort. The question of the desulphurization of Kimmeridge oil was one which commercial men would find would well repay further study at the hands of chemists. He and another speaker inquired if the author knew if nascent hydrogen had been applied in conjunction with a catalyst for removing the sulphur from the oil vapours, on the lines of the Evans process for the purification of coal gas as adopted by the South Metropolitan Gas Company. Mr. Manfield, in the course of his reply to the discussion, said there was a sufficiency of sulphuretted hydrogen in the gas and vapours evolved in the retorting of Kimmeridge shale to form sulphuric acid for the neutralization of the whole of the ammonia. He did not himself know of trials of a catalyst in the purification of the oil, though its use for the purpose had been patented.

A short description was then given by Messrs. Luis de Florez and E. L. Lomax of a new method of ascertaining the contents of any horizontal cylindrical tank. The method is obviously applicable to all horizontal cylindrical tanks, whether used for petroleum, or tar, or tar oils, and may therefore be of interest to readers of the "Journal." The volumes of the contents of any horizontal cylindrical tank if plotted in a curve represent a double parabola, each parabola representing half of the tank. If, therefore, a true parabola is plotted on a percentage scale, a graphic representation of the percentage volume of the cylinder in the ratio of the percentage height is obtained. The only further figures necessary for the calculation of the contents of the tank at any dip are its diameter and total contents when completely filled. This gives a graphic method of estimating the contents of a tank at any dip—the calculations being in this way reduced to a minimum.

The late Sir Henry E. Roscoe, whose death occurred last December, left estate of the value of £44,871, with net personalty £44,787.

The annual meeting of the Institution of Mechanical Engineers was held last Friday. Among the items of interest to "Journal" readers in the Council's report was a statement that premiums of £5 each have been awarded to Professor A. H. Gibson, D.Sc., and Mr. W. J. Walker, B.Sc., for their paper on the "Distribution of Heat in the Cylinder of a Gas-Engine;" also that a grant of £15 was made from the "Bryan Donkin Fund for Original Research in Mechanical Engineering," to Mr. Arthur H. Barker, in aid of his Research at University College, "to investigate a new method of determining the radiant temperature and air temperature in a room." The Council announced that Mr. Harry E. Jones (a member) has accepted their invitation to deliver the "Thomas Hawksley Lecture" this year.

COAL HANDLING AND CARBONIZATION.

By JAMES DICKSON, of Kirkintilloch.

[A Paper read on Saturday, Feb. 19, before the Scottish Junior Gas Association, Western District.]

The matter of which I shall speak is my own personal experience as obtained at the Kirkintilloch Gas-Works. The subject is, I believe, the all-important question in a gas-works, as the late Mr. Henry O'Connor often mentioned in his lectures to students that the profits in a gas-works largely depended upon the results obtained in the retort-house. Our works are comparatively new, having been built only seven years ago. They were visited by the Association four years later; so I need not describe them, but will just confine myself to such parts as are pertinent to the treatment of my subject.

COAL HANDLING.

With regard to coal handling, I do not think a great deal can be claimed by any individual as to any saving exercised in this direction—of course, I mean in smaller or medium-sized works (say) carbonizing up to about 40 tons of coal per day, and where horizontal settings with hand charging are used. The position of the works with regard to railways or other means of transport will be the determining factor as to the cost of the work. For any special saving we must, ere we build works, thoroughly consider this matter, and only build where means of transport—either for imports or exports—will be best served and with greatest economy. Works, of course, with no railway accommodation, are placed at a great disadvantage by their having to pay for the extra handling and cartage of all material necessitated by want of railway facilities.

The matter of convenience in coal-handling appears to have been well thought out, ere our site for the works was chosen. They are not in the natural position one would expect—being at an altitude of about 50 feet above the lower part of the town, where the old works were situated. But, as I have already said, it is just when one considers fully the question of oncost, in its relation to economy, that the necessary foresight requires to be displayed.

With us, we feel we have benefited to the fullest extent by this consideration, as we have a railway running through both sides of our retort-house—a building 96 ft. 6 in. long by 150 ft. 6 in. broad. The bench is in the centre, with the railway running on either side between it and the coal-stores. The line of rails determines the extent to which our coal-store can be extended; but it will allow us a depth of 25 ft. 6 in., so that we have a store of considerable dimensions. At the present time we have in the west section a reserve stock of 850 tons, which has not been interfered with for fully two years. On the other side of the house, is the same depth of coal-store, but its length is somewhat reduced because of a door which forms the entrance to the coke-yard, through which all the char from the retort-house passes. The length of this store is 80 feet, and so is capable, if filled to the same height as the other, of carrying 700 tons. For our every-day working, these railways inside can quite comfortably hold eleven waggons between them. Therefore we have, taking each waggon at 8 tons, (say) 88 tons upon which to work. Thus we have far above our actual requirements for any one day or even a week-end; and not only have we this, but with our railway running out through the retort-house, we have space on both lines on either side, for four waggons in each, so that future requirements are well provided for.

Our coal is almost entirely handled by the stokers. It is filled by them into their bogies direct from the waggons. In this way there is seldom any cost incurred in handling other than this. We endeavour so to arrange our supplies that just sufficient is delivered to meet our actual requirements. That we have been fairly successful this year in maintaining proper regulation of our traffic is in no way due to any special favours on the part of our contractors, but rather to the fact that our yield of gas per ton has been increased by fully 20 per cent., which also represents the amount of coal saved, as coutracted for.

Our present rate of cost for coal-handling and carbonizing is exactly 2s. per ton. This also includes the discharge of coke into the yard ready to be loaded into waggons. Of course, as it is necessary to carry a stock of coal, this incurs extra labour and extra cost. We endeavour to stock 1000 tons; and we find that to do so the past five years has, on an average, cost ¾d. per ton of coal carbonized. Adding this to the 2s. already mentioned, our carbonizing and coal-handling costs us 2s. 0¾d. per ton. At the old works, with less favourable conditions, but with a much lower rate of wages, the cost per ton amounted to 2s. 8d. Thus, something is possible to be saved if this subject is fully and carefully studied before proceeding with the construction of any works. The saving is, I think, to be found by getting direct handling by the stokers without any additional labour, as the stokers have to fill their own coal in any case. If, therefore, this is secured, one can save considerably in the cost of handling coal. In comparing the cost of coal handling with that of our old works, I might say that at the old works every pound of coal had to be double handled—having to be emptied by the labourers into the store and then lifted into bogies and conveyed to the retort-house for carbonization.

New Works.

Cost of coal handling by stokers	2s. 0d. per ton.
Cost of stocking coal	0 0¾ ,,
Total cost	2s. 0¾d. ,,

Old Works.

Cost of coal handling by stokers	2 5 per ton.
Cost of stocking coal	0 3½ ,,
Total cost	2s. 8½d. ,,

In reviewing these figures, a saving of 7¾d. per ton is shown. The greater part of this is saved in handling by stokers, whose charges are all weighed out to them on two platform weighbridges placed on a convenient spot on each side of the retort-house. Our stokers were always supposed to handle 3 tons of coal per shift; but this was never maintained, so long as they were allowed to put in what suited themselves. It was with this knowledge, therefore, that we adopted the present system of weighing all charges, which has brought about a saving of 5d. per ton over the old system. I think from these figures, you will agree that our efforts have been well rewarded. There was at first, considerable trouble when the men found out that they had been working at a low level with regard to weight; but by foresight, the trouble was prevented from becoming a menace. Previous to this we entered upon an agreement with the men, that a rise of 3d. per shift would be granted to them on the adoption of the system—pointing out to them that heavier charges with longer duration reduced the number of operations from 24 to 18. Their grievance then soon ceased.

With the saving of 7¾d. per ton shown, it might be thought that my figures are not consistent with my belief in what I at first stated as to the saving in coal handling; but as this method of operations could quite easily have been adopted at our old works with the same comparative saving per ton, I still contend that our principal economy, and the only saving that was possible to get (had the men been properly watched with regard to the weight of coal handled), would have been the 2¾d. in direct handling from the waggon. Of course, the nature of our new works allows for more efficient and easier labour for the men.

CARBONIZATION.

There can be no gainsaying the importance of this subject. Much has been, and is still being, said concerning it. Eminent men have disclosed ideas (many of which are hostile to the present mode of carbonization), thinking that much more could be taken from the coal and its residual products than has hitherto been the case. Personally, I feel akin to some of these ideas, especially that which Mr. Cranfield brought before us at our last annual meeting. His idea was to supply a gas of lower value, whereby it could be made much cheaper and serve all purposes equally as well as our gas to-day, be it for power, incandescent lighting, gas-fire, or furnace heating, or for any other ordinary domestic or commercial use. Of course, in the matter of flat-flame illumination, exception would have to be taken to this, which would prove of no value. But, the fact is that, at present, the light obtained by this means in any town's gas is not of much consequence; and not only so, but it is so much more extravagant with comparatively no efficiency against an incandescent gas-burner, that people who really desire a good light would not consider of much importance the loss of such an illuminant as flat-flame gas.

Our retort-bench consists of twelve ovens, built back to back, six on each side, having eight retorts in each oven—thus giving us in all 96 retorts. This retort strength is capable, at the past rate of increase, of meeting our requirements for very many years, and more especially if we consider the results obtained by us in the present year. At our heaviest period of gas making this year, we had forty retorts in use; while for doing the same amount of work in former years, we had fifty-six retorts in use. Thus you see that, while in the past at our maximum make we had reserve retorts to the extent of 70 per cent. this year, we had at our maximum season 140 per cent. reserve retorts, or the reverse conditions from last year—namely, forty retorts in use and fifty-six idle against fifty-six in use and forty idle. Of course, with the advance of years, and the advent of incandescent lighting now so generally used, the way has been opened-up for greater achievements in the matter of carbonization, as this eliminates to a great degree the necessity to supply gas of such illuminating power as would please the public in their notions of what this should be, and which would have been impossible of attainment in older days, and from such coals as are available at the present time, at a moderate price.

While I have said this, I do not agree that the question of candle power has with us altogether been neglected; but I might say that we are yet well within our prescribed limits, as we supply gas of 15½-candle power. For us to secure the results we now have means considerably more attention in the matter of maintaining heats and keeping the settings in good working condition. This is a continuous job, as in a matter of twenty-four hours, if the fires are neglected, the effects very readily show themselves. In the working of our settings, we have a fixed time for cleaning the producers; so that such a period will be convenient for inspection being made during the ordinary working day. The flues and air-ports are set for the men, and they are not allowed to interfere with their setting; but we find that they scarcely ever need alteration. Our chimney draught is maintained at an almost constant vacuum of between 5-10ths and 6-10ths. Our draught

gauge is fixed in the engine-house; so that it is always before our notice, and if need be we have the warning to make such alterations in our flues as will best suit the conditions of draught.

Any little trouble that does arise is due to the fur which collects inside the flues. But this is seldom; and if cleaned out (say) once in six months, the trouble is avoided—providing that vigilance is exercised over the men in their duties. Our heats are maintained very regular; and to this, with good hydraulic main and exhauster attention, we attribute the more efficient manufacture of gas, and the higher yield per ton.

Our retort charges vary with the position of the retorts. The centre retorts are generally the hottest; so we charge them with 3¾ cwt. of coal; the sides, with 3½ cwt. each; while the bottoms which are reasonably always of lowest temperature, are charged with 3¼ cwt. The temperature of the retorts as we have them-is 2156° Fahr. centres, 2084° Fahr. sides, and 2012° Fahr. bottoms—working, as I have already stated, with the varying charge in each pair of retorts for a duration of six hours. Maintaining such heats as these, we use more fuel than we otherwise would; but I think that we have made up this deficiency by producing with these higher temperatures a harder coke and one which gives very little breeze.

Our sale of coke from May 15 to Jan. 31 was 9·27 cwt. per ton of coal carbonized; while last year for the same period the yield was 9·79 cwt. Against this, we have further to put the loss in breeze. For our own use, we have had to purchase breeze elsewhere for boiler-firing—our make of it being inadequate to meet requirements. Since May 15 we have purchased 220 tons 15 cwt. of breeze; and of this quantity we have now in stock about 50 tons. But even at that it means fair purchase, as in older days, when our make was much smaller, we could quite well afford to sell considerable quantities of breeze after having satisfied our own requirements.

Another trouble which we have solved with this means of working is the carbon. We have never once required to scurf our retorts this season. The carbon when it gets about ¼ inch thick falls off. Frequently we have large sections of it drawn out with the charge. Thus we can more easily heat the retorts with the absence of such a bad heat-conductor upon the inner surface of them. This also gives us constantly the full capacity of the retort; so that no difficulty is experienced in putting in the full amount of coal. When working in past years in our heavy season we very often had a considerable area of the retorts occupied by carbon, which might have been extra gas measured and passed into the holder.

The reason we attribute for this is the fact that we charge our retorts as rapidly as possible; so that within the shortest space of time, all the mouthpiece doors are closed-up. We then increase the pull on the exhauster for about a half to three-quarters of an hour; and this is the period wherein the greatest achievement is to be got. I might also say that we have abandoned the use of our retort-house governor and compensating steam-throttle valve on the exhauster engine. We found that the retort-house governor served no useful purpose; and the compensating control was not sensitive enough to answer the small increases and decreases in the pull which we found necessary to maintain the conditions required. We therefore thought it best to abandon their use altogether.

The hydraulic main, as I have mentioned, is a thing of much importance, which with us also has had a great deal of supervision. We endeavour to maintain a seal of about ¼ inch, and run the exhauster to suit the quality, as shown by the jet photometers. One of these instruments is placed on the retort-house wall, while the other is in the engine-house, inside a case on the window, which can be seen from either inside or outside. When therefore the engineman who attends to the exhauster is doing his other duties, he has always under his eye the quality of his make. At first when we considered such a scheme as having enginemen for these separate duties, we were very reluctant to instal such men, as the leading stoker (who was paid a little extra per shift) had hitherto performed the duties connected with the exhauster and steam-boiler. But now, since we have experienced their value, we consider the change was amply justified.

With regard to the quality of gas, it is an indisputable fact that (within limits) the higher the make per ton, the greater will be the tendency to reduce the thermal efficiency of the gas. With us I may frankly say that we have reduced our standard. But this has proved for us an advantage, as now, with our lower standard, we must maintain it regularly, and consequently we have less complaints now than in former years. At first we supplied a gas of 19-candle quality; but with this, any difference in quality gave rise to complaints not so much of bad gas, as invariably the cause was attributed to dirty gas. When the light got a little bad, the consumer, by turning on more gas, generally improved it, but, unconsciously to him, as the gas regained its standard the admixture was too rich, thus giving rise to a deposit of carbon upon the mantle.

Before embarking upon the system of securing high yields of gas per ton of coal, it is necessary for one to count the cost, and see whether or not it will be best in the final reckoning to follow such a course. Up to two years ago (for four years in succession) we showed a profit on the residuals over the cost of coal and other raw material brought into the works; but with a lower yield of gas and the extra cost in handling the greater quantity of coal and residuals, the cost per 1000 cubic feet showed no better results. On the other hand, the extra working added to the charge for maintenance of plant and to the difficulties in the winter season of procuring deliveries of coal and selling the residuals. Our average make per ton will give us this year at least 12,000 cubic feet; while six years ago, our make per ton amounted to only 8924 cubic feet. This, I think, when compared with the results obtained at that time, leaves no doubt that we have chosen the better part in launching out for our present attainments.

DISCUSSION.

Mr. JOHN WILSON (Falkirk) remarked upon Mr. Dickson's advocacy of low-grade gas and the abolition of flat-flame burners. But it must be remembered that the flat-flame light was the only one that could be successfully used in engineering machine shops. The provision of the flat-flame light was a thing they really required to face. If they were not going to supply gas suitable for flat-flame burners, then they should promote some scheme whereby they could enrich the gas for those works where it would be consumed in such burners. He did say that they ought to listen to what those people who were using gas in the machine shops were saying, because they were going to be up-against it so far as the engineering shops were concerned. Mr. Dickson said that the temperatures in the retorts varied round about 2000°. How did he arrive at these temperatures, and where was the reading—was it in the retort or in the combustion chamber? As to the falling off of the carbon in layers, why did it happen when it did not do so formerly?

Mr. JOHN FRAZER (Dalmarnock) was baffled by the statement that the Kirkintilloch coal storage cost was ¾d. per ton. They must get their coal stored very cheaply. He was doubtful as to how the figure was arrived at; and he did not see how there could be any difference in the storing of the coal between the old and the new process. It was his opinion that the falling off of the carbon in the retorts was due to the great amount of attention paid to the hydraulic main.

Mr. D. T. MARWICK (Dawsholm) expressed his amazement at the big make. Mr. Cranfield had given them a lecture on low-grade gas; but he had not said it was all air that went into low-grade gas. He had his doubts that the 12,000 cubic feet were obtained legitimately. Though he believed in low-candle gas to an extent, he felt the consumer was "paying through the nose."

Mr. ALEXANDER WRIGHT (Lockerbie) said he had been thinking of a retort-house governor for his works; but Mr. Dickson decidedly stated that the retort-house governor was of no use. He had always understood it was of great value; but if it were valueless for Mr. Dickson's works, it might be of use for a smaller establishment. In all other views he had heard expressed, and in all addresses he had listened to, the retort-house governor was defined as being of great advantage.

Mr. THOMAS MOFFAT (Tradeston) said he was very much of the opinion of Mr. Dickson. Regarding the seal, they would find in taking down the hydraulic main that what had been ¼ inch was perhaps about 2½ inches, and that there was fluctuation in the main all the time.

Mr. JAMES BELL (Kirkintilloch) said that, without hesitation, he could assert that the retort-house governor, instead of being a benefit, was a drawback. What was the use of throttling-down, and thereby increasing the work of the exhauster? They wished to give the gas as free a passage as they possibly could. On the other hand, the up-keep was excessive. The governor bell, in his experience, might only last six months, and this was a serious matter. The effect of the retort-house governor in throttling-down the gas and putting extra work on the exhauster was a thing to be avoided. With regard to the magnitude of the make, there were works that were producing 14,000 cubic feet of gas per ton. They must, of course, be getting a lot of air in it.

Mr. G. T. PURVES (Auchengeich), dealing with the fall of carbon in the retorts, said that Mr. Dickson had referred to low seal and other factors. But none of these factors in perfection would stop carbon. He could say that the fall of the carbon was due more to heavy charging than steady pull.

The PRESIDENT (Mr. David Fulton) said that if the cost of handling the coal was only ¾d. a ton, Mr. Dickson must have had very little ingoing and outcoming during the last five years. The wages figure of 2s. per ton was exceedingly low. If the stoker dealt with 3 tons of coal and got 6s. a shift, he alone was responsible for 2s. a ton. But these were the wages of the exhauster-man; and they must be included in the carbonizing wages. Mr. Dickson was wrong in his interpretation of the views of experts on the gas production ideal. The idea was high heat and high yield of gas, whereas Mr. Dickson had contended for the opposite. On the question of the flat-flame burner, he thought the incandescent light could be used everywhere.

Mr. DICKSON, in reply, in dealing with the difficulties of the retort-house governor, said that immediately one charged up one obtained an extra evolution of gas. Consequently, they had to put extra weights on the governor. He might remark that they had engineers in their district content to use the incandescent light. The retort temperatures alluded to had been taken within 2 feet of the back of the retort. These temperatures were fairly high for ordinary horizontal retorts; and they were not obtained without great supervision on their part and much attention to cleaning. The carbon trouble was solved by the extra pull they had when the retorts were newly charged. With regard to the cost of coal handling, they so arranged their supplies that they had almost sufficient to meet their immediate requirements; so that there was little ingoing and outcoming from store.

NOTES ON PURIFICATION.

By WILLIAM BENNETT, of Greenock.

[**A Paper read before the Scottish Junior Gas Association, Western District, Feb. 19.**]

The subject of purification is one of considerable importance and well worthy of an interesting discussion, which the writer hopes will follow the reading of these notes.

Briefly, the impurities in crude coal gas consist of aqueous and tarry vapours, carbon dioxide (CO_2), sulphuretted hydrogen (H_2S), ammonia (NH_3), carbon bisulphide (CS_2), with other sulphur compounds and cyanogen bodies. The amount present of each of these impurities depends on a variety of factors—such as the coal itself, its physical condition, the moisture content, the duration of charges, temperature, and method of carbonization. Where vertical retorts are in use, the regulation of the heat is a factor governing the amounts of impurities produced—that is, the impurities are different when working good top heats than when there is a fairly long uniform heat. This regulation of heat in verticals opens up a wide field for discussion, and can be more suitably dealt with in a paper on vertical retorts.

It is essential that the tar and tar-fog be removed to the fullest extent; otherwise much trouble will be caused in the purification plant, owing to the "clogging up" of the brushes and filling material in the scrubbers and the oxide in the purifiers, rendering the former inefficient, and causing excessive back-pressure to be thrown by the latter.

The thick tar should be removed quickly before the condensers and while the gas is still fairly hot—say, about 140° to 160° Fahr. This will prevent the undue absorption of the light hydrocarbons. The light tars and tar-fog must, however, be effectively removed before the gas enters the scrubbers, and care should be taken that all tar, after condensing, is removed at once out of contact with the gas; otherwise, if allowed to flow with the gas, the tar will give back naphthalene vapours to the gas. This was very noticeable with us when working with horizontal retorts. The tar in the seal-pot of the tar-extractor and inlets to the well gave off considerable quantities of naphthalene, which deposited on the seal-pot cover and crown of the well, just as ammoniacal liquor flowing into the open gives off NH_3. With gas from the verticals the naphthalene content is very low, and we do not find the same effects.

The removal of carbon dioxide by lime purification is rightly almost a process of the past. Since the addition of carbon dioxide only reduces the calorific value *pro ratâ*, then so long as we can keep the CO_2 content down to reasonable limits, we ought not to concern ourselves about its complete removal. What we should aim at is a gas of nearly uniform composition and calorific value.

With regard to the removal of CS_2 and sulphur compounds other than H_2S, providing they can be removed simply and at little cost no one will object to doing so. But unless found in abnormal quantities, their presence is of such little consequence that we are not at all justified in complicating the plant or adding materially to purification costs.

There is without doubt a certain corrosive action going on in meters, service-pipes, and gasholder plates, due to the presence of cyanogen; and this action is increased by the traces of ammonia and oxygen often present in the gas—ferrous ammonium ferrocyanide ($Fe(NH_4)_2Fe(Cn)6$) and prussian blue ($Fe_7(Cn)18$) being formed. In the paper "Notes on the Corrosion of Service-Pipes" read by Mr. Macleod before the Institution of Gas Engineers in 1911, analyses were given of several deposits taken from the services in Greenock, all of which showed the presence of cyanogen. This internal corrosion is not only detrimental to the pipes and fittings, but also forms a nucleus for the deposition of naphthalene, often resulting in final stoppage. The cyanogen also locks up a certain amount of the purifying material by combination, and forms a protective coating round some of the oxide—thus preventing complete sulphiding. With vertical retorts in use the cyanogen content is low; but with horizontal retorts and high temperatures, and consequently a greater amount of hydrocyanic acid, it may be advisable to remove it altogether in some portion of the plant preceding the purifiers. The ammonia and sulphuretted hydrogen must, of course, be completely removed before sending the gas out to the district.

The removal of the above impurities commences immediately the temperature of the gas takes the down-grade; but apart from tar extraction, and partial naphthalene removal, the gas reaches the washers or scrubbers before we have much control over the operations. From six-tenths to seven-tenths of the ammonia yield is condensed out with the aqueous vapour in the hydraulic mains and condensers. This virgin liquor, having condensed out at comparatively high temperatures, contains but little H_2S and CO_2, and, instead of being allowed to flow into the common well, may be separated from the tar and afterwards used in the scrubbers, where it can be usefully employed to remove CO_2.

It is intended in these notes to deal but briefly with washing and scrubbing, and to go more fully into questions concerning dry purification by means of oxide of iron. At the inlet of the scrubber the NH_3, CO_2, and H_2S may be taken to be present to the extent of, roughly, 130, 3000, and 800 grains respectively per 100 cubic feet of gas.

As you are well aware, the removal of ammonia is effected by taking advantage of the great solubility of ammonia in water. At ordinary temperatures and pressures, one volume of water dissolves about 760 volumes of NH_3, three volumes of H_2S, and one volume of CO_2. These figures are correct only when the absorbent water is brought into intimate contact with the pure gases and full atmospheric pressure is maintained. When dealing with mixed gases, such as crude coal gas, the pressure exerted by each constituent is the same as if it alone were present and occupied the whole space. That is to say, if the percentage of NH_3 present is 0·4, then the pressure exerted by the NH_3 is the same as if 0·4 cubic foot of ammonia was expanded to 100 cubic feet, or $\frac{1}{250}$th of the total pressure.

By Henry's law, the volume of a gas absorbed is directly proportional to the pressure exerted by the gas; so, if dealing with clean water, the NH_3 absorbed would only be $\frac{1}{250}$th of the above. Further, given a fixed temperature, liquors of varying strength have certain ammonia pressures. The pressure varies directly with the strength. If this pressure is greater than the ammonia pressure in the gas, then ammonia will be given up to the gas. If the ammonia pressure in the gas is greater than that in the liquor, then ammonia will be absorbed. To put it another way, ammonia molecules are constantly leaving and entering the liquor, and equilibrium is established when the same number of molecules leave and enter the liquor in the same time. If the pressure of the gas is increased, more molecules of ammonia enter the liquor in a given time and a greater volume is absorbed, until the strength of the liquor is increased to give a pressure to balance the increased ammonia pressure in the gas. Consideration of this fact leads to the conclusion that in principle it is wrong to place a washer on the exhaust side as is sometimes done. The pressure exerted by the last traces of ammonia is so small that it is extremely difficult to get it into solution.

The absorption of ammonia increases with a decrease in temperature of the washing water; but the temperature should not be too low, otherwise ethylene and benzene are thrown out. Other actions take place besides the absorption of ammonia in water; ammonia having an affinity for both the H_2S and CO_2, as represented by the following equations:—

(1) $NH_4OH + H_2S = NH_4HS + H_2O$
(2) $2NH_4OH + H_2S = (NH_4)_2S + 2H_2O$
(3) $NH_4OH + H_2CO_3 = NH_4HCO + H_2O$
(4) $2NH_4OH + H_2CO_3 = (NH_4)_2CO_3 + 2H_2O$

It will be seen from an examination of these equations that, even if we could utilize all the ammonia in the gas and have the most favourable chemical actions—namely, (1) and (3)—taking place, there is not anything like the amount of ammonia present for complete purification at this point. Self purification, or the extraction of the H_2S and CO_2 in the gas by the NH_3 also present, has been, and still is, a fascinating problem for chemical engineers, and many processes have been brought forward with a view to utilizing the ammoniacal liquor over again after expelling the H_2S and CO_2, in order to make up for the initial shortage of ammonia required for the complete elimination of the above impurities.

None of the processes brought forward is, however, so simple and sure in its actions as to warrant the disuse of the efficient, if somewhat cumbersome, method of oxide purification. The acid radical CO_2 is a stronger acid than H_2S, and will turn out the latter from combination with ammonia. This being so, it should be endeavoured to so arrange the plant that the liquor is kept in contact with the gas for a lengthened period, in order that the CO_2 shall largely be absorbed at the scrubbers and the H_2S driven forward to be dealt with by the purifiers. Another point to be noted is that where liquor is sold on a distillation test, no credit is given for the sulphur content, which, under present methods of oxide purification, means a direct loss of revenue. Further, where the cyanogen is not specially extracted, the lengthened liquor contact will—where the air for revivification is admitted before the washers—reduce the cyanogen content of the gas by forming ammonium sulphocyanide. In this case there will be a slight loss of sulphur and the fixing of a little ammonia. Working in this way, the liquor can be made to take up about five equivalents of CO_2 to one of H_2S, and at the same time the strength of the liquor be brought up.

DRY PURIFICATION.

As already stated, the use of lime is being rapidly abandoned. The frequency of changes required, the cost of the lime, and the nuisance when spent, made it far from being an ideal material.

With the abolition of the sulphur clauses, purification by means of oxide of iron quickly sprang into general favour. Unlike lime, it is limited in its action to H_2S, and under certain conditions HCn and possibly CS_2, the CO_2 passing forward unchanged. The fouled material is readily revivified and made ready for use again.

Formerly the usual procedure was to have three out of four boxes working, with one off for emptying and revivifying. When the gas showed foul on entering the third box, the sequence was altered, so that No. 2 became the first and the clean box was placed last. The first box, now foul, was then shut off and opened out; the material being spread in the open for revivification purposes. The following represent the reaction taking place:

Sulphiding
$2\,Fe_2O_3H_2O + 6\,H_2S = 2\,Fe_2S_3 + 8\,H_2O$
$2\,Fe_2O_3H_2O + 6\,H_2S = 4\,Fe\,S + {}_2S + 8\,H_2O$

Revivification
$2\,Fe_2S_3 + 3O_2 + 2\,H_2O = 2\,Fe_2O_3H_2O + 6\,S$
$4\,Fe\,S + 3O_2 + 2\,H_2O = 2\,Fe_2O_3H_2O + 4\,S$

The oxide was thus brought back to its original state with the deposition of free sulphur. The result is just the same as if the oxide merely acted as a catalytic agent for the oxidation of the H_2S, thus:

$$6\ H_2S + 3O_2 = 6\ H_2O + 6\ S$$

After revivification the oxide was returned to the box which was placed last in the series, when another change was made. The number of changes required to bring the sulphur up to 50 per cent. varied from 12 to 14. The process was both expensive and offensive—gas being lost at each change, and heat evolved when revivifying, causing unpleasant odours to arise.

The next step made was the introduction of oxygen (as air) along with the gas, so that revivification would go on at the same time as sulphiding. This was a decided advance on the former practice, and the number of changes required was reduced. Working as before, however—that is, the foulest box first and the clean box last—it was found impossible to get the theoretical quantity of oxygen taken up.

From the equations given above there appears to be no chemcal reason why the actions should not go on indefinitely if the right amount of oxygen (as air) be admitted and the conditions be such that the actions go on at equal rates. The only reason for any change is increase of bulk causing excessive compactness and prevention of intimate contact between gas and oxide by deposition of sulphur. Other factors, however, enter into the question; but these will be dealt with later. For the moment look at it from the point of view represented by the above equations. Why should the oxygen not be taken up to the full extent?

Quantitative tests have been made of the H_2S and O_2 in the gas at the inlets of each of the boxes. These tests bring out the fact that the sulphiding action and oxidation of the sulphides formed do not take place to any extent side by side. Generally H_2S alone is taken up by the first box, the oxygen passing through untouched into the second and third boxes, which, being comparatively clean, offer but little scope for oxidation. The same with the fourth box where four are in use.

The next step that was undertaken was an attempt to separate the processes of sulphiding and oxidation in such a way that the oxygen passing through the boxes actively sulphiding would enter the boxes already sulphided and unaccompanied by H_2S. Under these conditions the oxygen is very active in the oxidation of the sulphides. This separation of H_2S and O_2 is brought about in two ways—either by "forward rotation" or "backward rotation." To work the system successfully in either way, the valves and connections to the boxes should be so arranged that the purifiers may be worked in any order. The Weck valve is really one of the best for this purpose. All four—where there are four—boxes are in use at the same time. This in itself is a great saving over the old method of three boxes on and one off—that is, 25 per cent. of the plant out of use. In the "forward rotation" method, the gas would be passed through series 1, 2, 3, 4, until showing pretty foul at the inlet of No. 3 box. The order would then be changed to 2, 3, 4, 1. This brings the foulest box last. Tests show that the H_2S is taken up by the first two boxes (now 2 and 3), while oxygen is being taken up actively by 4 and 1—the last two boxes. When the gas at the inlet to 4 shows sufficiently foul, or alternately when an excessive amount of oxygen is getting past the purifiers, the series is again changed to 3, 4, 1, 2. Nos. 3 and 4 now take up the H_2S while Nos. 1 and 2 are being revivified, and so on.

The following represents the series of changes:

1, 2, 3, 4; 2, 3, 4, 1; 3, 4, 1, 2; 4, 1, 2, 3; 1, 2, 3, 4.

When a box comes into the first position, it takes up about 95 per cent. of the H_2S entering the boxes, and continues to do so for three or four weeks—depending, of course, on the rate of flow. It is difficult to remove the remaining 5 per cent. in the second box; and it often happens that sufficient H_2S gets forward to the third box to give a foul test with lead acetate paper. It is difficult to explain why this should be.

The following tests were made on the purifiers at Greenock. The purifiers, which were seen when the Association visited Greenock some weeks ago, consist of six boxes, 40 ft. by 30 ft. by 6 ft. deep, with dry lutes operated by Weck valves—one for two boxes and one for four boxes. Hurdle grids are employed throughout. [See "JOURNAL," Sept. 9, 1913.]

Order of Working Purifier-Boxes 4, 5, 1, 2.

—	H_2S at Inlet.	H_2S Taken Out by Box.		Oxygen Taken Up per Cent. by Volume of Gas.
	Grains per 100 Cub. Ft.	Grains per 100 Cub. Ft.	Per Cent. of Total H_2S Entering Purifiers.	
No. 4 box	554·5	527·1	95·06	*Nil*
,, 5 ,,	27·4	20·6	3·72	*Nil*
,, 1 ,,	6·8	6·8	1·22	0·3
,, 2 ,,	0·0	0·0	0·00	0·1

It will be observed that although only 27·4 grains of H_2S per 100 cubic feet of gas enter No. 5 box, which is the second in the series, it only takes up 20·6 grains, leaving 6·8 grains to be dealt with by the third box (No. 1 in this case). In order to demonstrate for the purpose of these notes that No. 5 box was able, under suitable conditions, to take up much more than this, the series was altered immediately after the above tests were completed—5, 6, 1, 2 now becoming the series. Tests were made some 24 hours later.

Order of Working Purifier-Boxes 5, 6, 1, 2.

—	H_2S at Inlet.	H_2S Taken Out by Box.		Oxygen Taken Up per Cent. by Volume of Gas.
	Grains per 100 Cub. Ft.	Grains per 100 Cub. Ft.	Per Cent. of Total H_2S Entering Purifiers.	
No. 5 box	575·7	517·2	89·84	*Nil*
,, 6 ,,	58·5	49·0	8·51	0·05
,, 1 ,,	9·5	9·5	1·65	0·30
,, 2 ,,	0·0	0·0	0·00	0·10

It does not often happen that oxygen is taken up in the second box—No. 6 had been standing off for some time owing to having caked-up, and was in a very foul condition. This is probably why oxygen was taken up here. It will thus be seen that when in the first position No. 5 is capable of taking out 517 grains of H_2S, whereas when in the second position it is unable to take out 27 grains. The gas flow was the same in both cases, and the temperature of the box was 59° Fahr. in the first position, and 61° Fahr. when in the second position. One possible explanation of the above results is that the presence of HCn, if present as free acid, might retard the final purification; the tendency of the oxide to take up H_2S being partly neutralized by the tendency of HCn to liberate H_2S from FeS.

$$18\ FeS + 36\ HCn = 18\ Fe\ (Cn)_2 + 18\ H_2S.$$

In the presence of oxygen this $Fe\ (Cn)_2$ would be converted into prussian blue.

$$18\ Fe\ (Cn)_2 + 3O_2 = 2\ Fe_2O_3 + 2Fe_4\ [Fe\ (Cn)_6]_3.$$

If the above action proceeded at a slower rate than the action of H_2S on the oxide, the additional contact in a further box would complete the removal of the H_2S. This, however, can only be a partial solution of the problem, for it still leaves the question as to why the HCn in passing through the last box, which is in a very sulphided state, does not liberate H_2S, unless it be that the HCn is here reduced to such a dilution limit that it ceases to be active. It is held in some quarters that HCn does not act on FeS. If this be so, it may still. if present in large quantities, act as a poisoner, preventing the absorption of H_2S by the oxide. Apart from all this, the molecular concentration of the H_2S is very low, and the rate of chemical action will be correspondingly low also, requiring a larger mass in order to deal with it.

The following table shows the distribution of the H_2S and O_2 as indicated by tests made on the purifiers some time ago:

Series 1, 2, 5, 6, 3.

—	H_2S in Gas.		O_2 in Gas.
	Per Cent. by Volume.	Grains per 100 Cubic Feet.	Per Cent. by Volume.
Inlet of No. 1 box	0·820	507·0	0·40
,, 2 ,,	0·084	52·0	0·35
,, 5 ,,	0·022	13·6	0·35
,, 6 ,,	0·022	13·6	0·10
,, 3 ,,	0·006	3·7	*Nil*

H_2S and O_2 Taken out by the Purifiers in the Above Tests.

—	H_2S.		O_2.
	Grains per 100 Cubic Feet of Gas.	Per Cent. of Total H_2S Entering Purifiers.	Per Cent. of Gas by Volume.
No. 1 box	455·0	89·74	0·05
,, 2 ,,	38·4	7·57	*Nil*
,, 5 ,,	*Nil*	*Nil*	0·25
,, 6 ,,	9 9	1·95	0·10
,, 3 ,,	3·7	0·74	*Nil*

As a rule the extraction of H_2S is completed in the third box, and oxidation commences in this box also, possibly in the lower part. But the above tests showed a rather curious state of affairs. Slight oxidation took place in the first box, but sulphiding went on all right until down to 13·6 grains. The process then completely changed over to one of oxidation, and would appear to have completed oxidizing before reverting back to sulphiding. The result was that H_2S was not eliminated before the fifth or catch-box. In changing the series, it is best to be guided by the oxygen absorption. When the quantity of oxygen taken up by the purifiers permanently decreases, this is the time to change.

In the backward rotation system, the final box is, at each change, brought to the first place in the series. Taking four boxes as before, we should have the following series:

1, 2, 3, 4; 4, 1, 2, 3; 3, 4, 1, 2; 2, 3, 4, 1; 1, 2, 3, 4.

Thus a box originally the first in the series travels backwards towards the end of the series. We have not tried this method;

the other having with us been quite successful. A box gets well sulphided in the first position, and one would not think it is then in the best condition for taking out the final portions of the H_2S as is required of a box in the second and third positions. In the forward system, a catch-box is required to catch the foul gas already in the box on changing to the last position. Where there are only four boxes and no catch-box, this can be obviated by making the changes more frequent, so that H_2S never shows at the outlet of the third box, and, following out the backward method, making rapid changes until the second series of the forward method is arrived at—*e.g.*:

1, 2, 3, 4; 4, 1, 2, 3 (rapid); 3, 4, 1, 2 (rapid); 2, 3, 4, 1.

When the oxide is well spent in a box and requires to be taken out, this is indicated by the box becoming quickly fouled when in the first position, with the result that only partial revivification in the last two boxes has been effected when a change of series is required.

There are causes other than the material being spent which might bring about this result. Before emptying a box, therefore, judgment should be used as to whether the material is spent; and it is quite a good plan to take samples of the oxide for analysis. This can easily be done by inserting a sampler—such as the long augur used for sugar sampling—through one of the blow-off valves or plugs on the covers; the box being shut off temporarily. When it is found that the oxide is really pretty well spent, the box should be placed last in the series—that is, follow out the ordinary sequence—and the gas passed through it in this position for a couple of days. This will precipitate the sulphur to some extent, so that on opening-out oxidation is reduced and the risk of fires minimized. If the system is intelligently worked, outside revivification and mechanical disintegrators for breaking up the partially spent oxide become unnecessary.

It has been stated [see paper by Mr. Howard Mann, of Montreal, in the "JOURNAL" for Oct. 13, 1914] that a purifier would not clean up in the last position if operated as the first box for two or three weeks, and would only do so if operated as the first box for two or three days or so and then changed to the last. This is in contradiction to our whole system of working. The last box certainly does pick up any oxygen that may enter it, even though previously in the first position for five or six weeks.

There are many factors which influence the efficient working of oxide purifiers. First and foremost is the oxide itself—*i.e.*, its composition, physical state, size, and wetness. It should contain a high percentage of hydrated ferric oxide, and bein a fine state of subdivision.

As a mixing material, old oxide in the proportion of one of old to five of new is good, and much better than shavings, sawdust, or coke breeze, the former two of which are difficult to mix, and all of which depreciate the value of the spent material and increase the liability of fire spreading should one take place locally. When put in ready mixed, the oxide should contain just sufficient moisture to prevent it passing through the bottom grids. If too wet when put in, "rat holes" are formed on drying, through which the gas takes short cuts.

Chemical action in the purifiers is an exothermic one—heat being evolved. This heat should be conserved. If the oxide is too wet the heat is rendered latent by evaporation of the water, and the temperature, and consequently efficiency, of the oxide is reduced. Temperature plays an important part. Most oxides have their highest efficiency at about 80° Fahr. With some of us a temperature of 80° Fahr. at the purifiers would result in the gas passing through the station meter at an abnormal temperature, and be very misleading unless frequent observations of meter temperatures were made. A temperature of 65° Fahr. is one we try to work at. If the temperature falls much below 50° Fahr. the oxide becomes sluggish.

In our case the boxes are artificially heated by means of a coil of 2-inch steam-pipe passing round the bottom of the interior of the boxes. We recently introduced live steam into the inlet leading to the last box—the gas here being free from H_2S—with a view to seeing the effect on the sulphur compounds. Our investigations are still proceeding, sufficient tests not having yet been made to justify any conclusions being drawn. A large purifying area is also essential, in order that there will be sufficient time-contact between the gas and oxide. It is not sufficient to just pass the gas through the oxide; time must be allowed for chemical actions to be completed, especially revivification. The gas must be free from tar-fog before entering the purifiers; otherwise the oxide is made to act as a filter, with subsequent back-pressure troubles and the throwing out of boxes before the oxide is spent.

In some quarters the caking of oxide is somehow or other associated with revivification *in situ*. Our experience is that it is the first box in the series which cakes-up, as shown by increasing back-pressure; yet, as will be seen from the table of H_2S and O_2 absorption, little or no oxygen is taken up here. Prior to the introduction of vertical retorts, and also about the same time that toluol extraction by tar washing was being carried out, our tar extraction was very complete, and we had little or no trouble with caking oxide. The tar from verticals contains only from 1 to 2 per cent. of "free carbon," against about 20 per cent. in horizontals, and the removal of tar-fog becomes much more difficult.

The following analyses of samples of oxide taken from the top caking layer, half-way down, and from the bottom of a box which had been throwing 10 inches pressure, point to the conclusion that the light oils and tar-fog (possibly increased by tar washing) carried forward by the gas to the purifiers, together with moisture and heat of chemical action, play a big part in this caking effect.

Analyses of Samples of Spent Oxide.—Dry Basis.

—	Top Caking Portion.	Centre of Box.	Bottom of Box.
	Per Cent.	Per Cent.	Per Cent.
Sulphur	59·49	61·28	61·90
Tar, &c.	6·77	1·81	1·22
Ammonium sulphocyanide (NH_4SCn)	4·63	1·72	0·13
Prussian blue ($Fe_4[Fe(Cn)_6]_3$)	4·72	5·23	6·21
Moisture in oxide as taken from box	5·38	1·92	1·42

The box had been on continuously for eleven months. The filtering action of the oxide is shown by the diminution of the tar content as we go down the box.

The decrease in ammonium sulphocyanide may be due to less being formed, or to the solvent action of the increasing water of formation in falling through the oxide. Possibly both causes are at work. The caked portion, 6 inches deep, was extremely hard, requiring picks to break through it; the remainder was quite loose and powdery. We are now taking steps to more effectively remove this tar-fog.

Tests for oxygen, as well as sulphuretted hydrogen, should be made at the inlet and outlet of the purifiers; and it is an advantage to make quantitative tests periodically—say once a week—to ascertain the work each box is performing.

The theoretical quantity of air to admit is two-and-a-half times the H_2S content by volume. If admitted on the vacuum side of the exhauster, the scrubbers take up some of the oxygen, and it is best to be guided by the oxygen content at the inlet of the purifiers. About 0·6 time the H_2S works well in practice, leaving only a trace in the outlet gas.

At many works elaborate arrangements of blowers, stepped cones, and air-pipes are in use for the purpose of putting into the gas a fixed proportion of air for revivification purposes, though on the same works it is probable that more than enough oxygen for this purpose is being "pulled" into the gas during the "draws" and through leaky lids.

If the oxide gets acid in character, the sulphuretted hydrogen converts it into iron pyrites, which does not revivify into activity. To prevent this, allowing a trace of ammonia to go forward with the scrubbed gas is sometimes advocated, though in ordinary scrubbed gas there are generally from two to three grains of ammonia per 100 cubic feet of gas, and this is sufficient with most oxides to prevent acidity. With gas thus slightly alkaline, ferric sulphide is produced, which revivifies readily. Further, any ferric sulphide which may have been oxidized to sulphate will be decomposed into ammonium sulphate and ferric hydroxide, which will be in a very active state for taking up sulphuretted hydrogen.

Upward or Downward Flow?

It is a decided advantage to work with downward flow—that is, inlets at the top and outlets at the bottom. When the gas enters at the bottom, the grids occupy one-half the area presenting itself to the gas, which means that the action on the other half area of oxide is doubled. Further, should caking take place, the water of formation from the material collects on this cake and assists in obstructing the free flow of gas. When the gas enters at the top, if there is caking at all it is spread over the whole area of the box, and the time elapsing before causing excessive pressure is correspondingly longer. It is then quite a simple matter to take off the covers and break up the cake without disturbing the rest of the oxide. In the case of upward flow, this would entail emptying the whole box.

Again, with the downward flow all the water runs freely away through the loose material underneath. It is the practice at some works to periodically reverse inlets to outlets and *vice versâ*; one object being to sulphide the oxide more uniformly. Our connections are not arranged to enable us to do this; and the analyses of the sulphur content of the oxide at different depths in the purifier do not show that any advantage in this direction would be gained. Hurdle grids are in advance of the ordinary kind. From 28 to 30 per cent. more oxide is got into a box, and it is held more loosely and of fairly even density throughout, with the result that there is more even sulphiding and less back-pressure thrown by the box. If the oxide be well packed at the walls of the box, there is no short-circuiting. On examining a box after twelve months' continuous work, no sign of short-circuiting could be seen. In filling up the box, sufficient room must be left between the oxide and the cover to allow for increase of bulk. In emptying a box with hurdles in use, care must be exercised. If the material has not caked the hurdles come away readily, and the oxide is easily shovelled out; but if caking has taken place, the use of a pick is necessary to break the cake, and there is a risk of one damaging the grids.

Taken all round, the time needed to empty and fill a box is about the same as with ordinary grids. It is a good plan to have the boxes elevated, with a mixing floor above. The oxide can then be stored ready mixed under cover, and is charged into the boxes by means of canvas shoots with the minimum of labour. When

spent, it is also readily discharged. The rubber lute type of cover is now generally recognized as being the most advantageous. The covers may be made in sections, and the lifting gear made correspondingly lighter. There is also no danger of lutes blowing, and no corrosive action as between wind and water in the water-lute type. In working the rotation system, the interval between changing valves is sometimes so long that, when attempting to change, it is found that the valves have become very stiff. To prevent this, the spindles should be kept clean and well lubricated, and the valves run up periodically.

The sulphur content of the gas supplied to the town averages 7·6 grains per 100 cubic feet. This low figure led to the thought that some reduction in sulphur compounds other than H_2S took place in the purifiers, possibly due to the absorption of CS_2 by the large amount of free sulphur in the oxide. Gas was led from the inlet of the purifiers through two small purifiers containing entirely new oxide, and thus freed from H_2S. The gas was then tested for sulphur compounds. The result of the test showed 9·06 grains of sulphur per 100 cubic feet at the inlet of the purifiers proper, and 5·7 grains at the outlet. It is to be noted that this is the result of one test only, and would need confirming by a series of tests.

While on the subject of CS_2 the following reversible reaction may be noted as possibly having some bearing on the fact that gas may be quite clean at the works and yet show faint traces of H_2S in part of the district.

$$CS_2 + 2H_2O \rightleftharpoons CO_2 + 2H_2S$$

The action takes place rapidly at 212° Fahr. and moderately at temperatures above 77° Fahr. This also may explain how in a works such as ours, where even a trace of H_2S in the gas leaving the works is practically unknown, yet on analyzing the deposits in the service-pipes free S was found.

Before bringing these notes to a close, it might be of interest to state that since adopting the "forward rotation" system we have had no outside revivification; the oxide once put in the boxes not being removed until ready for sale. This is of special benefit during these times of labour scarcity, and financially it has meant that for the last two-and-a-half years our purification has been a source of profit to the department.

[The writer here wishes to express his sincere thanks to his chief (Mr. James Macleod, F.I.C.) for his kindness in allowing him to bring before the members the particulars contained in the paper, and for the encouragement received in its preparation.]

Northern Gas-Workers' Wages.—At a meeting of the Northern Executive Committee of the National Union of Gas and General Workers, held at Sunderland, the District Secretary reported that he had been in negotiation with the Sunderland, South Shields, and Tynemouth Gas Companies for an advance of wages. A settlement had been arrived at with the Sunderland and Tynemouth Companies for an additional war bonus of 1s. 6d. per week; and it was expected that an arrangement on similar lines would be effected with the South Shields Company.

A "Bad Gas" Resistance League.—With regard to the paragraph appearing in last week's "JOURNAL" [p. 376], in which it was stated that at a public meeting at Brentwood (Essex) the quality of the gas supplied by the Brentwood Gas Company had been severely criticized, it may be mentioned that the Engineer and Manager of the Company (Mr. H. D. Lumb) has addressed a letter to the local papers in which he points out that the statements there made were entirely *ex parte*. Mr. Lumb adds: "If I had been invited, I would have willingly attended, prepared to answer any question, and to remove any wrong impression. As it is, I can only say I totally and strongly disagree with all that was said and done on that occasion."

Redcar Gas Company.—The Redcar, Coatham, Marske, and Saltburn Gas Company's annual report states that the amount available for apportionment is £3803; and the Directors recommend a dividend of 4 per cent. on the original and "A" shares (making 8 per cent. for the year), and £2 16s. per cent. on the "B" and "C" shares (making £5 12s. per cent. for the year), free of income-tax. This will absorb £2368. The balance of £1435 is to be carried forward. The gas consumed shows a decrease of 9·8 per cent.; but this is regarded as being entirely attributable to the effect of the restricted lighting order. The price of gas was advanced on July 1 by 2d. per 1000 cubic feet; but on Jan. 1 this year, the charge was reduced to the figure at which it stood prior to the war. Some 30 per cent. of the Company's employees have joined His Majesty's forces; and allowances have been made to their dependants. There has been a shortage of labour; but the supply of gas has been well maintained.

Middlesbrough and the North Ormesby Gas-Works.—Since the amalgamation of North Ormesby with Middlesbrough about two years ago, the North Ormesby Gas-Works have not been used; and at a meeting of the Middlesbrough Gas and Electricity Committee last Tuesday, a letter was read from the Teesside Bridge and Engineering Company offering £127 10s. per annum, representing 7½ per cent. on their estimated value of the property, for the lease of the land, with the option of purchase. The Chairman (Mr. Calvert) said there was no prospect of the demand for gas increasing to call for the re-opening of the North Ormesby Gas-Works. It was decided not to sell; but a Sub-Committee were empowered to arrange for the best terms for a lease. The Chairman reported that in the first ten months of the financial year, the Middlesbrough gas undertaking had made more profit than in the previous twelve months. Probably next year would be as profitable as the present one. The year's surplus would, he thought, cover the cost of all extensions of mains which had this year to be met out of revenue.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Pitch for Gas Making.

SIR,—Some weeks ago it was suggested in your columns that pitch should be used for gas making. At the present time, when coal is difficult to obtain, and huge stocks of pitch are speedily accumulating all over the country, the suggestion was most opportune; and I am pleased to record my thanks to those who have already entered the experimental field and given us the benefit of their experience. The value of pitch in gas-making has up till now never been seriously investigated; but the lack of data at this juncture need not deter engineers from giving it a trial upon a practical scale.

In our case the use of pitch is quite feasible, and at the present time profitable. Acting upon the suggestions in the Technical Press, I immediately began to use an admixture of pitch with coal in our horizontal retorts; and at the same time I carried out in our experimental works a series of twelve tests with a view to ascertaining the comparative values of coal carbonized alone and coal admixed with 10 per cent. of moderately hard pitch. The coal used was a first-class Lanarkshire double nut, freshly worked, and quite dry. The pitch used was obtained from a 65 per cent. mixture of vertical retort tar and 35 per cent. of horizontal retort tar. It softened at 80° C.; "twisted" at 75° C.; and fused at 95° C.

The retort in the experimental works is of fire-clay, 21 inches by 15 inches by 8 ft. 6 in. long; and the remainder of the plant is in exact proportion. Oxide of iron is used for purification. The carbonizing temperature was exceptionally good; the 2-cwt. charges being burned off in 2 hrs. 50 mins.; and every precaution was taken to obtain really reliable results.

To secure a thorough admixture of pitch and coal, it is best to break the pitch into small pieces. Even the pitch dust can be employed with advantage.

The following are the results of our tests:

Average Results of Tests per Ton of Material Employed.	Coal 2240 lbs.	Coal 2015 lbs. Pitch 225 lbs.
Gas made per ton (corrected), cubic feet	12,103	11,841
Illuminating power (No. 2 "Metropolitan" burner)	15·70	15·83
Calorific value, gross	574·1	612·5
Carbonic acid, per cent.	1·95	2·03
Coke, pounds	1,400	1,358
Tar, gallons	7·91	8·75
,, specific gravity	1·225	1·220
Liquor, gallons	15·4	16·0
,, strength, degrees Twaddel	2½	2½

It appears, therefore, that a ton of the pitch used in these experiments yielded 9488 cubic feet of gas. Compared with the all-coal results, the admixture of coal and pitch yielded rather less coke per ton of material; rather more tar, highly viscous, and holding more water in suspension; about the same quantity of liquor; and 262 cubic feet less gas of higher calorific value. The mixed coke is of excellent appearance, and burns well in an ordinary domestic hearth. It was noticed that the carbon deposited upon the retort differed from that usually found.

The above results did not exceed my expectations; but I considered them sufficiently alluring to continue the carbonization of pitch upon a working scale.

At first a 10 per cent. admixture was tried; but, owing to the pusher-heads of the hydraulic charging machines in the horizontal retorts becoming quickly clogged with melted pitch, this quantity was reduced to 5 per cent.; and during the past three weeks this proportion has been constantly admixed with the coal with satisfactory results.

Up till now we have not had a single choked ascension pipe; neither have we had trouble with pitch in the hydraulic mains.

We have also tried a 5 per cent. admixture of pitch in a bed of four vertical retorts (Woodall-Duckham); but after fourteen days continuous use, we had to abandon the experiment, owing to the coal and pitch coking and bridging-over solid just below the junction of the mouthpiece and retort, and also at the gas off-take pipe. We also noticed that the pitch was inclined to soften immediately above the coal feed-valve—thus binding the coal, and preventing a free discharge through the valve to the auxiliary coal feed-hopper.

When pitch is used in vertical retorts, it is necessary to completely empty the overhead storage hoppers when retorts are put off for scurfing, or stop using pitch a day or two in advance of the scurfing process.

As a result of experience gained, we are now trying a 5 per cent. admixture of pitch in our two vertical retort benches on alternate days—*i.e.*, a mixture of coal and pitch one day and coal alone the following day. This may prevent premature coking at the top of the retort, and will be equal to an admixture of 2½ per cent. per day only. Ultimately the quantity may be increased, as our experience extends.

I have no hesitation in advising the use of pitch for gas making—even the smallest works can safely do so—and with hand-charging 10 per cent. judiciously admixed with coal should give no trouble.

As this subject is one of much interest, I hope engineers generally will publish the results of their experiments for the mutual benefit of the industry.

ALEX. YUILL, Engineer and Manager,
Dundee Gas Commission.

Dundee, Feb. 15, 1916.

Showroom Reform.

SIR,—Adverting to the article by Mr. Cyril Davis in your issue of Feb. 8,

I quite agree with him as to what an attendant should be; but he loses sight of the fact (but I think he knows) that it is not altogether the fault of the attendant that he does not attain a higher standard of dignity and efficiency. This, I think, is due to the undertaking not

giving him the position that he should have. By uplifting, instead of crushing him, let the man feel he has a position, and give him a chance to assume the dignity and authority necessary to carry on efficient salesmanship.

To quote "Sheldon," it is unfair to give a man responsibility without authority; also to expect him to dress and live up to a higher standard than his income will allow, although many are struggling to do so at the present time. This is undoubtedly a question for the heads of gas undertakings, who should take their attendants a little more into their confidence, and discuss the position, so that the desired result be obtained.

Further, I would ask, Is a salesman properly described, and are the general public expected to look up to the word "attendant," when referred to him by a third party?, as "Oh yes, Madam, you had better see our showroom attendant"—"the official in charge of various conveniences is so described."

FAIRPLAY.

Feb. 17, 1916.

SIR,—I quite agree with your correspondent, "Showroom Attendant," that there is little in Mr. Cyril Davis's admirable article in your issue of Feb. 8 to which exception can be taken. His hints as to personal appearance, cleanliness, and dress are, of course, perfectly sound, but one would think so obvious as to be almost superfluous, and apply equally to all who are brought into contact with the public in the interests of their employers.

Of much more importance is it, I venture to think, that he should (as Mr. Davis suggests) make himself acquainted with everything that he possibly can connected with the gas undertaking. He should be something more than a mere salesman. He should be competent to advise as to the economical consumption of gas, to which end a knowledge of gas manufacture, pressure, and tested results of various burners will help him. If a consumer gave him sufficient data to form an idea of the cubical space of a room and the window area, he should be able to advise the size of fire necessary to warm it. But is he encouraged in this connection? No; should he do so, he is presumed to have encroached on the inspector's province, and finds later a different fire advised, and the consumer afforded the further information that the showroom attendant did not know what he was talking about, and that only he, the inspector (probably recently promoted from the fitter's bench), was competent to advise.

And at what showroom is an attendant encouraged, or indeed permitted, to write letters to a consumer? No, Sir, he is too often regarded as only a shopman, incapable of writing a letter, and lacking the technical knowledge to advise a consumer. The erstwhile gas-fitter on his promotion to an assistant inspectorship—notwithstanding his usually narrow knowledge of the gas industry generally, and not too liberal educational equipment—can at once look forward to a far more generous scale of remuneration than any showroom attendant.

If Mr. Cyril Davis's article, and your own sympathetic editorial remarks, induce managers and others to encourage initiative and recognize more liberally our status, you will have earned the gratitude of all showroom attendants.

ANOTHER SHOWROOM ATTENDANT.

Feb. 18, 1916.

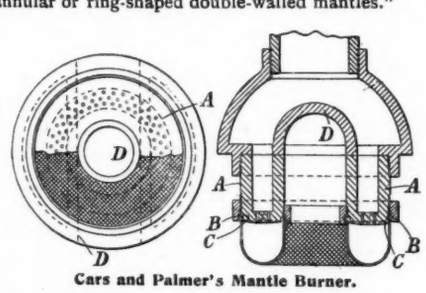
REGISTER OF PATENTS.

Obtaining Illumination by Incandescent Mantles.

CARS, B., of Highbury, and PALMER, W. D., of Muswell Hill.

No. 1005; Jan. 21, 1915.

This invention has for its object "to obtain an improved burner for use with annular or ring-shaped double-walled mantles."



Cars and Palmer's Mantle Burner.

An underside view of a high-pressure burner and mantle constructed according to the invention (the mantle being partly removed) is given; also a vertical section of it.

The gas distributing chamber of the burner is of hemispherical shape, and serves the purpose of preheating the mixture which flows into it from the tube above. Carried by the chamber and opening into it is an annular double-walled nozzle A formed like a hollow ring tipped with refractory material and perforated with fine holes through which the mixture issues. The annular or ring-shaped double-walled mantle, "of known construction," fits on to the annular nozzle, and is held in position by the inner wall being carried by an exteriorly threaded ring of refractory material which screws upon the threaded end of the inner wall of the nozzle as shown in the section. The outer wall of the mantle is furnished at its top end with a bead or thickening B, and the periphery of the nozzle with a groove C, while above the groove the nozzle is threaded so as to screw on to an interiorly threaded ring of refractory material so arranged that in its lowermost position it presses the bead of the outer wall of the mantle into the groove of the nozzle, thus clamping the outer wall of the mantle securely in position.

In order to furnish a central draught for the products of combustion from the flame, a transverse outlet D, communicating with the space between the inner walls of the nozzle and the outer air, is provided.

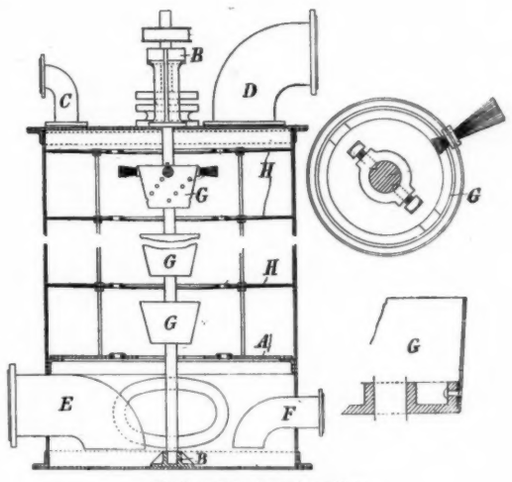
The ring of flame issuing from the perforations in the burner ring, "which develops intense heat," is said to be more evenly distributed over the surface of the mantle than heretofore, rendering it highly incandescent and producing "from one mantle a very high candle power for a given consumption of gas."

Scrubbing Gas.

MACLAURIN, R., of Stirling.

No. 1380; Jan. 28, 1915.

In a gas-scrubber in accordance with this invention a vertical casing or tank is provided with means for supplying a scrubbing liquid at the top of the casing and gas to be scrubbed at the bottom, a plurality of horizontally disposed annular dish-shaped plates or partitions, and a series of vessels disposed in vertical succession therein and adapted to be rapidly horizontally rotated in unison—each vessel being provided with brushes having short flaring bristles communicating with the interior of the vessel. The arrangement is such that the scrubbing liquid thrown against the sides of the vessels by centrifugal action comes in contact with the inner ends of the bristles, travels along the bristles to the outside of the vessel, and is thrown from the bristles as a fine spray or rain.



Maclaurin's Gas-Scrubber.

A vertical central section is shown through apparatus embodying the invention; also enlarged detail views of one of the vessels.

The casing or tank is preferably circular in section, having a bottom plate, an intermediate false bottom or horizontal partition A, and a top plate, all secured together. Above the top plate and on the bottom plate are arranged bearings B, in which is mounted (so as to be rotatable) a shaft driven from a pulley above, or by any other suitable mechanism. At the upper end of the casing is an inlet conduit C for the washing or scrubbing liquid and an outlet conduit D for the gas. At the bottom of the casing is an inlet conduit E for the gas and an outlet F for the washing or scrubbing liquid. Arranged in vertical succession along the shaft are vessels G that rotate each in a horizontal plane. Also arranged in vertical succession within the casing is a series of horizontally disposed annular dish-shaped plates H provided with apertures to facilitate the passage of the gas. The plates H and vessels G are arranged alternately. Each vessel G is open at the top, and is provided at the bottom with an upstanding annular flange surrounding the central opening through which the shaft passes; and each vessel is secured in position on the shaft by set-screws or bolts. The sides of the vessels are provided with brushes (as shown) with projecting bristles—the whole having a flaring or conical shape. The holes shown n the uppermost vessel are provided for the purpose of inserting the sockets of the brushes (the brushes themselves being omitted for clearness of illustration). No brushes are shown mounted in the other vessels, but each vessel is so provided.

The operation of the apparatus is as follows: The liquid entering at C flows down upon the uppermost plate H. Owing to its shape, the liquid flows towards the centre, and is delivered into the uppermost vessel G. As this vessel is rapidly rotated, liquid falling into it is thrown towards the sides by centrifugal force, and comes in contact with the inner ends of the brushes, passes along the bristles, and is thrown from them as a fine spray in every direction owing to the flaring shape of the brushes and their disposition around the vessel. The rain of liquid thus formed is caused to impact violently against the wall of the casing and falls on to the second plate H of the series, flowing towards its centre and thence into the second vessel. This operation is repeated with each plate H and vessel G until the bottom of the casing is reached, where the liquid is drawn off through the outlet F. In the meantime the gas to be scrubbed has entered through the inlet E, and rising up comes into contact with the lowermost vessel G, and, striking the brushes and revolving parts, receives a swirling motion and is thrown against the shell of the casing—being brought into intimate contact with the washing liquid as it impacts violently upon the casing. The gas meets each vessel and its projecting brushes in turn, and "is thereby given a long travel through a mist of liquid, so that by the time it has reached the top of the apparatus it has parted with its deleterious matter."

Controlling the Charging and Discharging of Gas-Retorts.

CARPENTER, H. A., and WARNER, A. W., of Sewickley, and the RITER-CONLEY MANUFACTURING COMPANY, of New Jersey, U.S.A.

No. 5266; April 7, 1915.

The primary object of this invention is to provide for so controlling the retort charging or discharging operations that they cannot ensue unless the mechanism immediately involved is properly positioned relative to the retort. For the charging operation, the desired result is accomplished by rendering the charging means inoperative until it is in proper position to co-operate with the retort; while for the discharging operation, that it cannot take place until the receiver is in proper position relative to the retort outlet to receive the coke. In cases where the entering fresh charge (or charge-carrying tool) is utilized for discharging the coked product of the last preceding charge, the arrangement is such that the fresh charge (or the device carrying the charge) cannot be entered in the retort until the coke-receiver is in position at the retort outlet.

The invention contemplates broadly the proper positioning of means adapted to co-operate with a retort at either end during a charging or discharging operation—regardless of any accomplishment at the other end. Thus provision is had whereby the charging of the retort is prevented until the charging means is in proper position relative to the retort inlet, and without taking into account what may transpire at the outlet. And, conversely, it contemplates properly positioning a coke-receiver relative to the retort-outlet without regard to any operation that may take place at the inlet, except in such forms of apparatus as those wherein the removal of the coke is accomplished only by force applied through the retort inlet.

In the preferred adaptation of the invention, "the operations of the retort charging and discharging instrumentalities are controlled electrically; it being necessary for such instrumentalities to be properly positioned relative to the retort in order to close interruptions in an electric circuit, the closing of which is prerequisite to energizing the mechanisms involved in the charging and discharging operations." Electrical control is, however, not essential, since it could be substituted by mechanical or fluid pressure control, or a combination of two or more such forms of control, without departing from the spirit of the invention.

A further object is to constitute the retort doors "auxiliary controlling instrumentalities," whereby one door (or both doors) is necessarily in open position before either the charging operation or the discharging operation, or both, can ensue.

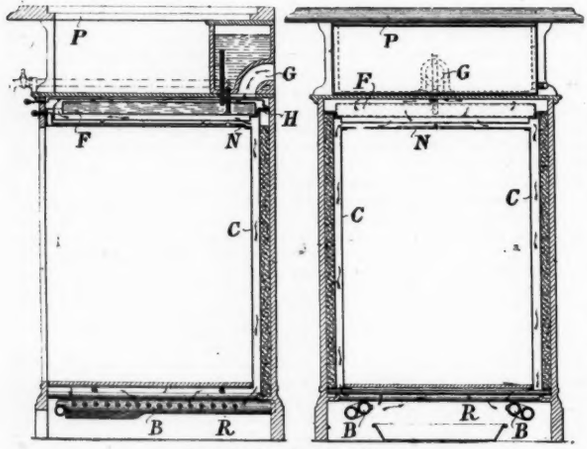
A series of detail drawings is appended to the patent specification. One is a diagrammatic view of apparatus wherein the operation of the retort-charging "instrumentalities" is dependent upon properly positioning the same relative to the retort inlet. There is a similar diagrammatic view wherein the retort-discharging means are rendered operative only by properly positioning a coke-receiver—the latter when in position serving to close an interruption in the controlling circuit whereby the retort-discharging means are rendered operative. There is a third similar diagrammatic view wherein the retort charging and discharging means are inoperative until the means and also the coke-receiver are properly positioned relative to the retort. The fourth is a detail view illustrating one of the interruptions in the controlling circuit which is opened and closed by the retort door.

Gas Cooking-Stoves.

CLOAKE, A. G., of Holborn Viaduct, E.C.

No. 8013; May 31, 1915.

The object of this invention is to provide a construction of oven which is loose and can be readily introduced inside the casing of such cookers as are now furnished with ovens open internally to the heat from the burners, so as to form an oven which is heated externally instead of internally.



Cloake's Gas Cooking-Stove.

A central sectional side elevation and a sectional front view of the suggested arrangement are shown.

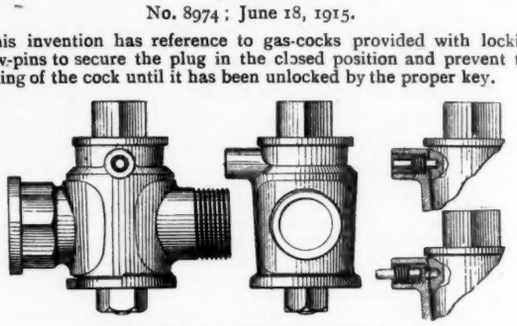
The cooker comprises the usual outside casing with a door in front (not shown). Into the space within the casing is introduced a removable rectangular box C, preferably with an open front adapted to be closed by the door of the casing. The box is supported on rods extending across the casing just above the burners B. Sufficient space is left between the box and the sides and the back of the casing for the heat from the burners to pass. Above the box is a plate having apertures for the passage of heat to the underside of the boiler F above the plate. Normally, the heat passes beneath the boiler towards the front of the cooker and returns on the upper side of the boiler to the flue G. An alternative course for the combustion products from the burners is provided by the damper H operated from the front of the stove by a rod. When the damper is open there is no draught around the boiler, and the fumes escape direct to the flue. The boiler has a circulating connection with the water-tank L. N is a ventilating damper for the oven, accessible by a rod from the front of the cooker. P is the usual hot-plate beneath which are the usual burners for boiling, grilling, &c. (not shown). An additional space for grilling is provided at R beneath the oven floor.

Gas-Main Cocks.

EVERED AND CO., LIMITED, of Smethwick, and PIZEY, J. C., of Tottenham.

No. 8974; June 18, 1915.

This invention has reference to gas-cocks provided with locking screw-pins to secure the plug in the closed position and prevent the opening of the cock until it has been unlocked by the proper key.



Pizey's (Evered and Co.) Gas-Main Cock.

The internally screwed tubular lug for the reception of the locking screw-pin is made (as shown) on the tubular body or casing of the cock in which the rotary plug is fitted above the "sealing" part, which ensures a gas-tight fit between the plug and the body or casing. In the lug is fitted the locking screw-pin the inner end of which, when the plug is turned off, can, by screwing, be made to engage with a hole in the plug and secure it against rotation until the screw-pin is withdrawn. The locking screw-pin is made with longitudinal grooves or channels for the reception of a projecting pin, or pins, or fingers, on the barrel of the key. The tubular lug is so constructed that the complete withdrawal of the locking screw-pin is rendered impossible; the inwardly turned flange of the lug having notches in it to permit of the projecting pins or fingers on the key passing through it.

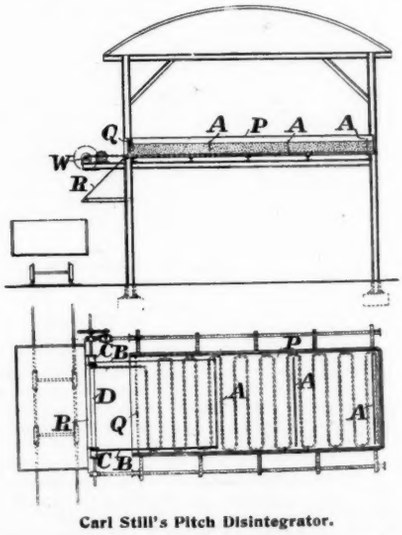
The illustration represents in side and end elevation a gas-main cock containing the improvements constituting the invention; also a portion of the cock partly in end elevation and partly in section with the locking screw-pin in the fastening position and in its withdrawn or unfastening position.

Disintegrating and Loading Hard Pitch.

CARL STILL (Firm of), of Recklinghausen, Germany.

No. 13,546; Sept. 23, 1915. Convention date, Oct. 2, 1914.

This invention is intended "to simplify essentially and cheapen the work of disintegrating and loading hard pitch or similar material which has been run into large open cooling pans or walled pits and has set therein." Heretofore the method employed not only entails considerable costs, but also has an injurious effect on the health of the



Carl Still's Pitch Disintegrator.

workers. By the present invention all disadvantages inherent in the procedure heretofore employed are obviated, and the work of disintegrating and loading the pitch is performed solely by mechanical means in a simple and rapid manner.

A vertical longitudinal section through a pitch pan and a part of the cooling shed employed is shown; also a plan.

The cooling pan P, of oblong rectangular shape supported on transverse and longitudinal beams, is arranged in the usual manner so that the one end Q is removable. At the same end of the pan a shoot R is fitted; and at a suitable distance from the end of the pan is journalled a shaft W, running in bearings fitted to the extended ends of the longitudinal beams. The shaft is driven by a motor and gearing. On the shaft are fitted two narrow drums C, and between them a long drum D extending across the whole breadth of the pan. Before the pan is filled with pitch, a link-chain of sufficient length is laid along the bottom of the pan (with its one end hanging out at the removable wall Q) in a waved or serpentine line, so that practically the whole area of the bottom of the pan is covered by it. Partitions A, extending almost across the whole breadth of the pan, are inserted into the pan parallel to the wall Q, so that after the pitch has been run in and set to a rigid layer, the partitions, as also the chain, are completely embedded in it. After the pitch has thoroughly set, the wall Q is first removed and the free end of the chain is coupled to the drum D on the shaft W. When the shaft is driven and the chain slowly wound up on the drum, "it will tear the whole layer of pitch in the pan into a large number of pieces which represent a heap of broken pitch ready for shipment."

For facilitating the removal of the broken pieces from the pan and their discharge into the transport means the partitions A may be utilized as scrapers, being drawn along the bottom of the pan by ropes B winding on the drums C, so that they will direct the pitch down the shoot R into the trucks run beneath.

The employment of a beam or scraper drawn forward by ropes was described in patent No. 7364 of 1915 in connection with the removal and loading of a mass of coke from a quenching bench. But the patentees claim that the present invention not only affords the advantage of considerable simplification and cheapening of the work of converting the pitch into a transportable form, but also of a considerable increase in the value of the final product.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Feb. 16.]

Nos. 1770—2132.

ADAMS, C. H.—"Boring and tapping machines." No. 1892.
BECKET, W. H.—"Cooking-stoves." No. 2004.
CANNON IRON FOUNDRIES.—"Atmospheric burners." No. 1968.
CHAMBERS, E. V.—"Removal of water from water-gas tar, &c." No. 2102.
CLARK, J. H,—"Incandescent gas-lamps." No. 1993.
FALK, G.—"Incandescent burners." No. 1806.
FALK, STADELMANN, AND CO.—See Falk. No. 1806.
FURBER, J.—"Preventing bursting of water-pipes." No. 1834.
HAMMOND, T. C.—See Chambers. No. 2102.
HAWTHORNE, H. S.—See Cannon Iron Foundries. No. 1968.
HELPS, G.—"Gas cookers." No. 1889.
HIRD, H. P.—See Chambers. No. 2102.
LACHMANN, W.—"Separating gases." No. 2005.
RICHARDSON, C. K.—See Chambers. No. 2102.
Riter Conley Manufacturing Company—"Conveying charges of material from one level to another." No. 1928.
STIMSON, E. F.—"Taps or cocks." No. 2007.
WHITE, A. E.—See *Riter Conley Manufacturing Company*. No. 1928.

PARLIAMENTARY INTELLIGENCE.

OPENING OF THE SESSION.

The Sixth Session of the First Parliament of the present King was opened on Tuesday of last week, when the Lord Chancellor delivered His Majesty's Speech to both Houses of Parliament. The Chairman of Ways and Means reported that he had conferred with the Chairman of Committees of the House of Lords (the Earl of Donoughmore) for the purpose of determining in which House the respective Private Bills should be first considered; and they had decided that the following Bills should originate in the House of Lords:

Aberdare and Aberaman Gas; Burnley Corporation Water; Colchester Gas; Ferndale Gas; Hornsey Gas; Imperial Continental Gas Association; Newcastle-upon-Tyne and Gateshead Gas; Yeadon Water.

The following Bills are accordingly allocated to the Commons:

Beighton and District Gas; Folkestone Gas; Northwich Urban District Council Gas; Plymouth and Stonehouse Gas; South Metropolitan Gas; Tynemouth Corporation Water; Uxbridge Gas; Wakefield Corporation Water.

All the Lords Bills have been read the first time, and, with the exception of Burnley, have been referred to the Examiners; and the Commons Bills have been read the first time and ordered to be read a second time.

Daylight Saving.

Replying last Thursday to Mr. Peto, who asked whether, with a view to saving electricity, gas, and oil, it was intended to propose legislation on the lines of the late Mr. Willett's Daylight Saving Bill, Mr. Asquith said he was afraid he could not introduce legislation on such a contentious subject.

Lighting Restrictions.

Mr. H. SAMUEL, in the House of Commons last week, stated that lighting restrictions were of great utility to the locality which adopted them. Within a day or two of the last air raid, a conference was held at the Home Office of officers of that Department and of the War Office and Admiralty. Within a few days an order was made extending the lighting restrictions to the whole of England, with the exception of a few outlying districts, and steps were being taken to extend them to Scotland.

Petitions Against Private Bills.

Petitions have been deposited against the following Bills:

Beighton and District Gas, by the Rotherham Rural District Council.
Folkestone Gas, by the Folkestone Corporation, and the Sandgate and Cheriton Urban District Councils.
Northwich Gas, by the Cheshire Lines Committee.
Plymouth and Stonehouse Gas, by the Great Western and London and South Western Railway Companies.
South Metropolitan Gas, by the London County Council.
Tynemouth Corporation Water, by the Ashington Coal Company, Morpeth Corporation, National Pawnbrokers' Association of Great Britain and Ireland and North and South Shields and District Pawnbrokers' Protection Association, and the Ashington, Bedlingtonshire, Blyth, Cramlington, Newbiggin-by-the-Sea, Seaton Delaval, Whitley and Monkseaton Urban District Councils.
Uxbridge Gas, by the Slough and Eton District Councils.

LEGAL INTELLIGENCE.

Water Used for Laundry Purposes.

At the Aldershot Police Court, some astonishing statements were made in connection with water charges and the earnings of some who do washing for the troops, in a case in which Ethel Broadwood was summoned by the Aldershot Gas, Water, and District Lighting Company for using water other than for domestic purposes. It was pointed out that a test case, in which the facts were practically the same, had already been decided in favour of the Company;* and, after a lengthy hearing, an inclusive fine of 30s. was imposed. It was stated that, apart from the contractors who did the work in bulk, quite a large number of the wives and widows of soldiers, as well as others, were allowed to undertake troop washing in their own houses in the town. The enormous increase in the consumption of water since the outbreak of war had, however, rendered it necessary that the Company should have absolutely under their control the water supply of the town; and an arrangement had been come to with the military authorities by which there was handed to the Company a weekly list of the women undertaking troop washing, and the amount of work done by each. In the case of the widow or wife of a soldier, the Company allowed her to wash for forty men without making any charge for water, and beyond this one-third of a penny per week was to be paid for every man washed for. If they paid at the Company's office within seven days of demand, they were allowed a rebate of 5o per cent. off the amount charged. Defendant, who was the widow of a soldier, had not conformed to this arrangement; and when she was in arrears to the extent of £5 5s. 10d., the agreement, so far as she was concerned, was cancelled. The landlord paid the ordinary water-rate. One of the Company's inspectors gave evidence that the military list received on the 3rd inst. showed defendant was washing for 335 soldiers. About a hundred women were doing troop washing. Defendant, giving evidence, was asked why she had not paid the money, and replied that she fell into arrears and was not allowed a rebate, and she could not afford to pay the full amount weekly. One week the amount she actually paid came to 26s. For the Company, it was pointed out that this amount would represent 936 soldiers washed for.

Application Regarding a Mantle Seizure.

Sitting in the King's Bench Division of the High Court of Justice last Tuesday, Mr. Justice Atkin heard an application to set aside three judgments, by Mr. B. Frank, of Amsterdam. The matter had reference to the seizure by the Customs of certain incandescent gas-mantles, of which he was the owner. Mr. A. W. Elkin stated that the mantles were made in Holland, and were seized in London after having been shipped from Rotterdam. After judgment had been signed on Dec. 17, in default of claim to the goods being entered, Mr. Frank applied to the King's Remembrancer to set aside the judgments; but it appeared that the King's Remembrancer had no jurisdiction to set aside judgments of this character, which had been signed on a writ of appraisement. Mr. Frank now asked that the judgments should be set aside to enable him to file his claim. After some discussion, it was arranged that the applicant should have leave to enter his claim to the goods; the judgments being set aside for this purpose.

A Polluted Water Supply.

An action, the hearing of which had extended over three days, before Mr. Justice Horridge, at the Derbyshire Assizes, terminated on Saturday in a verdict being given for £250 damages against the Blackwell Rural District Council. The claim was brought by Ann Truswell, a widow, of South Normanton; the Jury finding that her husband's death was caused by the presence of typhus bacillus in defendants' water supply. The presence of the bacillus they held to have been due to the negligence of the defendants by leaving in a bye-pass unprotected at its open end, which should have been closed at both ends. The bye-pass bore the collar joint through a sand hole, in which sewage matter entered the main from a fracture in the adjoining sewer.

* See "JOURNAL," Vol. CXXVIII., p. 141.

MISCELLANEOUS NEWS.

COMMERCIAL GAS COMPANY.

The Ordinary Meeting of the Proprietors was held last Thursday, at the Cannon Street Hotel, E.C.—Mr. W. Graham Bradshaw in the chair.

The Secretary (Mr. F. J. Bradfield) read the notice calling the meeting; and the Directors' report and the statement of accounts were taken as read.

A Satisfactory Result in Face of Many Difficulties.

The Chairman, in moving—"That the report and accounts be received, adopted, and entered on the minutes," said: Gentlemen, the accounts deal with the third half year passed under war conditions; and the shareholders are to be congratulated that they give such satisfactory results. The difficulties to be surmounted have not been few or slight; and they are by no means past. But so far they have been met and overcome successfully; and, from that fact, we may gather hope and courage for the future. It is, I think, a matter for gratification that, with only a moderate rise of 4d. per 1000 cubic feet in the price of gas, we have been enabled to earn our full dividend, and carry forward an increased balance of undivided profit to the current half year, and that this result has been achieved in spite of the higher cost of coal and oil and of nearly all the materials we use in our business, of higher freight charges, of a diminishing staff, and of higher wages. You will readily understand that the main cause of anxiety at all times is our supply of coals. First there is the purchase in the North; and then they have to be brought to our works in London. In both these matters, our difficulties since the war began have been great. The large number of colliers who joined His Majesty's forces reduced the output of coal, caused a large rise in prices, and rendered it doubtful whether there would be enough to go round. This difficulty was partly met by the institution in May last of the licensing system for the restriction of exports.

New Coal Contract Prices—Cost of Sea Transport.

So far as we are concerned, the collieries from whom we buy our coals, and with whom we have dealt for many years, have treated us well. Our ships have been loaded promptly; and our supplies have been well maintained. You will be glad to know that, although our existing contracts have still some months to run, we have already arranged for all our usual supplies for more than twelve months ahead. The prices have not yet been fixed in all cases; but we have actually contracted for a substantial quantity at a price considerably less than the limit fixed by the Price of Coal (Limitation) Act, 1915, which was passed last July. That is a reassuring feature of the position. But when we have bought our coals in the North, we have to bring them to our works in London. I have on more than one occasion pointed out to you the very large saving which has been effected by the possession of our own ships. Freight and shipping charges, although they have cost us—owing to restrictions in the North Sea, higher wages, and more expensive bunker coals—more than double what they were ten years ago, 5½d. a ton more than in the last half year, and 1s. 0½d. more than twelve months ago, are yet 10s. a ton less than current market rates. You will not wonder that our Engineer wrote to me recently: "To me our ships are one of the joys of my life." I am glad they are; for it was his enterprise and perseverance which led to our acquiring them now some fifteen years ago.

Insurance against Aircraft Risks.

It will, I think, tend to make you comfortable to know that we have fully insured our works against aircraft risks under the Government insurance scheme. The insurance does not, of course, cover the loss of business which would result if the works were severely damaged; but it does ensure that the loss would be confined within strict limits, and would be only of a temporary character.

Higher Price of Gas and Increased Sales.

I mentioned last August that we had been compelled to raise the price of gas by 4d. per 1000 cubic feet—*i.e.*, from 2s. 4d. to 2s. 8d. It is interesting to see that the Stepney Borough Council Electricity Department have decided to increase their charges for electricity by 15 per cent., which is about the same rate as our increase. It is satisfactory to note that, in spite of the higher price, our sales of gas increased by nearly 25 million cubic feet, or 1½ per cent., of which increase 10 millions came from ordinary meters, and 21 millions came from prepayment meters; the difference of 6 millions being due to the decrease on the public lighting. The improvement in the ordinary consumption was largely owing to the increased trade consumption, and also to the number of stoves and fires fitted. During the half year, 1311 additional stoves were fitted to ordinary meters, and 1768 to prepayment meters. It is probable a part at any rate of these increases is due to abnormal activities created by the war; and therefore they may not be maintained. But it must be borne in mind that the earlier closing of shops and the restrictions on public houses have considerably reduced their consumption of gas; and this part of our trade will probably recover at the end of the war. I should like to repeat and emphasize what has so often been pointed out, that coal burnt in an open grate is consumed in the most extravagant way possible, because all the bye-products, such as ammonia and tar, which are of such vast importance to the country at the present time, as being the materials from which high explosives are manufactured, are thereby lost. Anyone therefore who uses gas or coke to warm his house, or cook his food, or drive his engine, is doing a patriotic service and deserves well of his country.

Projected Tar Distillation.

The mention of tar leads me to explain that we contemplate a considerable modification in dealing with it. Hitherto, we have sold our tar to tar distillers at a price based on the value of its constituent elements; and the results have not been unsatisfactory. But now the low price of pitch, caused by high freights and the partial loss of the markets of Northern Europe, and the high prices of some of the distillates of tar, are leading us to the conclusion that we can get even a better return by undertaking some of the processes of manufacture ourselves. I may mention here that the amount of tar made per ton of coals last half year is the highest on record, and is doubtless due to the recovery of an extra amount of toluol from the gas. I wish, however, to point out that, although the gas companies are rendering valuable aid to the Government by furnishing them with toluol and benzol, and by manufacturing munitions, they are not deriving much profit from doing so. In our case, in the half year under review, only £744 has been received from toluol, and having regard to the additional expense incurred in the extraction, and the necessary outlay on plant, very little of this can be considered as profit. Moreover, the price obtained for the tar (including the amount received for toluol) has been exceeded by tar only, without the extra toluol, five times during the past eight half years. I am sure, however, that you will agree that no right-minded person wishes to make a profit out of the necessities of his country.

Munitions Work.

You will be glad to know that all our plant which is not required on absolutely indispensable repairs is engaged night and day in munition work, and that one of our Assistant District Engineers, Mr. F. L. Hart, has recently been appointed to succeed our Mr. G. M. Gill as District Manager under the Metropolitan Munitions Committee, and is doing invaluable work in that position.

Financial Results.

I will now call your attention to the principal variations in the figures of the accounts which are before you. The item in the capital account for freehold land was in respect of the purchase of a portion of our Wapping works which we held on lease. We have been waiting for many years for the opportunity of buying the freehold; and it was of great importance to obtain it, otherwise we should not have expended capital in this way at this time. I have already explained the other items of expenditure on capital account. The expenditure on revenue account amounts to £249,898, which is £20,000 more than it was in the corresponding period of last year. This increased expenditure may be divided in round figures under the following heads: Manufacture of gas was £16,000 more, distribution of gas cost £2000 more, expenditure under the head of management £1000 more, and war allowances to employees £2400 more. These several figures aggregate £21,400. But there was a saving in the profit-sharing bonus of £1400, which makes the net increase £20,000. The £16,000 extra cost of manufacture was made up of £10,707 the increased cost of coals, of £4290 for oil, and £1000 for wages. Coals carbonized cost 1s. 10⅓d. per ton more than last half year, and 1s. 7⅓d. per ton more than in the last half of 1914. But these increases do not represent the full measure of the rise in price of coals contracted for last year, because a part of the coals used were bought under previous contracts at a lower price. In the current half year, the cost of coal will again be considerably higher. The higher cost of oil is due to increased prices; and I fear we must anticipate a further increase in price when next we enter the market. The increase in carbonizing wages is due to the war bonus. Distribution charges were more by £1880 on account of the war bonus, the larger amount of work which had to be done, and the higher cost of materials. Rates are more by £657, owing to increased poundage. The increase in management charges is due to the cost of the quinquennial assessment and to the aircraft insurance. There is an item on this side of the account which has not appeared before. In previous half years, it has been included in the salaries and wages of the different departments. Allowances to employees on active service cost us £2460. I am on safe ground when I say that not one of us grudges in the smallest degree these allowances to the brave men who have offered themselves for the protection of their country. The least we can do is to keep their minds at rest that the loved ones whom they left behind are being adequately provided for. The war bonus, included under other heads in the accounts, cost the Company in the half year no less than £8641, so that allowances and extra wages and salaries totalled over £11,000. In the same period last year the amount was only £1469. On the other side of the account, we sold nearly 25 million cubic feet more gas, and charged 2s. 8d. per 1000 cubic feet, instead of 2s. 4d. Hence we realized more from gas sold by £28,312. Residuals yielded more than ever before in the history of the Company—producing £18,376 over last year's good results. Of this sum, coke produced more by £14,229; tar, more by £986; and sulphate, more by £3221. It is noteworthy that the average price obtained per ton of coke, which was 17s. 6d., is the highest ever realized by the Company; the previous best being 15s. 7d. in the first half year of 1913. Altogether, the receipts on revenue account were more than in the corresponding half of 1914 by £46,980, and our net profit is £72,760, as against £46,208—an increase of £26,552. In the second half of 1914, our profit fell short of the dividend and interest by £18,294; but in the same period of 1915, we have earned our full statutory dividend and interest, and have a surplus of £13,527. At the commencement of the half year, we brought forward a balance of undivided profit amounting to £65,623; and we shall carry forward £79,151 to the current year. This balance of profit is by no means large, in view of the uncertainty of the times. The cost of coal and oil will certainly be heavier in the present half year, and still greater in the following half year; while it is improbable that the price of residual products will materially improve. Our capital account is overdrawn by £69,863; and we have had to borrow £25,000 from our bankers for working capital.

Work of the Officers, Staff, and Employees—The New Chief Engineer of the South Metropolitan Company.

Now let me conclude with a few words of appreciation of the splendid work achieved by all ranks of the Company's employees. I am convinced, after 28 years of experience of this and other concerns, that no company have, or could have, a keener, abler, or more devoted body of officers than you have. And this opinion is fully shared by others who are better qualified to judge than I am. The fly in the ointment which tempers my satisfaction is that the chiefs of other companies continually cast hungry glances at our men; and I live in fear of losing those whom I am proud to call my friends and colleagues. Sometimes

an offer comes of an appointment which is so good that in all honesty we are obliged to advise that it ought to be accepted. In the half year under review, our Assistant Engineer, Mr. Geoffrey Gill (who is a son of our former Chairman, Mr. J. Blacket Gill), was offered the post of Chief Engineer of the South Metropolitan Gas Company. Such an offer, coming from so distinguished a gas engineer and administrator, and so keen a judge of men, as Mr. Charles Carpenter, could not be lightly refused; and we have lost Mr. Gill. I am assured that our loss is the gain of the South Metropolitan Company, and that Mr. Gill will render them as able and efficient service as he gave us through all the sixteen years of his work with us. He has acquired his knowledge and experience in our works; and his promotion reflects honour on this Company, and on Mr. H. E. Jones and our present Engineer, who gave him his training. We wish him every success in his new position, to which he takes the friendship and respect of all his old associates. I am happy to be able to say that we have other young men coming forward—keen, industrious, and well versed in the technicalities of their profession—who are finding now an opportunity of promotion in our service. You are already aware of the debt that we owe to Mr. Stanley Jones for his admirable administration of the Company. Much of its success is due to the keenness and energy which he inspires in his staff, and to the harmony and good feeling with which all ranks co operate with one another. This quality, which is a marked feature of our staff, is due in large measure to his example and personal influence, and reveals him as a true leader of men. Mr. Bradfield is winning a name for himself outside the Company by his useful statistics which he prepares so promptly and accurately each half year. His services to the Company are invaluable. They are your chief officers. But there are others who do splendid service, among whom I would specially single out Mr. P. E. Williams, the Manager of our Poplar works, of whose services it is impossible to speak too highly. We do not forget the gallant men who have gone from our midst to serve their country on the field of battle, six of whom have laid down their lives. Nor must we omit the brave seamen, who face the perils of winter storms, of submarines, and mines in the North Sea, to keep our works supplied with coal, and so bring to the munition and other factories of our district the heat and power without which they could not do their work. Besides these there are the managers of the different departments, the clerks, and workmen who ungrudgingly give their best service to supply the place of those who have gone to fight. A German writer, eulogizing war, has remarked that one of its advantages is that it strips men of false reputations and shows them up in their true characters. Certainly war, like every other trial, calls for all the energy, fortitude, and self-denial of which the individuals composing a nation are capable, and in this respect it reveals who is worthy, and who is not. The war has done us this service, that it has shown more clearly than ever before that the Company are served by an able, reliable, and industrious body of men who may be depended upon under all circumstances to do their utmost for its prosperity. I trust that their efforts may be crowned with success in the future, as they have been in the past.

The Deputy-Chairman (Mr. H. E. Jones), seconding the resolution, said he should not detain the proprietors, as he could not possibly add to the lucid information given by the Chairman. But he might draw two conclusions from his speech. In view of the fact that the War Department were relying upon the gas industry so much for residual products—not only for the products of tar that had been mentioned by the Chairman, but for ammonia and the acids—there was no doubt the Government would see that the main cause of anxiety to the gas industry for some years, that of getting coal, was removed, and that the requirements would be fully met. There was a security in this position that they had never had before. With regard to the needs of the Government for the products of the carbonization of coal, he had no doubt the proprietors had seen the circulars in which the Government urged people to burn gas and coke, and so save coal; for the Government had not been slow in pressing gas undertakings for a still further contribution of products which they required from them, and this, he hoped, the proprietors and the Directors would be patriotically willing to give them without any cost or profit whatever. Anything they could do for the advancement of the war they ought and should do. With regard to the position of the Company, he saw from the splendid return with which the Secretary presented them, that they had lost their place among the three premier Companies in respect of the sale of gas in London. The Brentford Gas Company had caught them up, and had passed them a little. But they all knew the development of population in the western suburbs. But, in the case of their own Company, forty years ago practically every yard of their area was built upon. In spite of this, however, their business had grown ever since. Concerning the officers, it was impossible for him to say all the Chairman had said of their Chief Engineer. If he was as good an Engineer to the Company as he had been son to him, there would be nothing of which to be afraid. As to the Secretary, he was very grateful to him, and so must be every gas politician, for the prompt manner in which he brought out every half year his statistical analysis of the London and Suburban gas accounts. The figures were a guiding line, and helped them in the administration of their various undertakings.

The motion was unanimously carried.

The Chairman moved the declaration of a dividend at the rates per annum of £4 18s. 8d. per cent. upon the 4 per cent. stock, and £4 13s. 4d. per cent. upon the 3½ per cent. stock, in both cases less income-tax.

Sir Frederick Green seconded the motion; and it was carried.

The Chairman proposed the re-election of the retiring Directors—Messrs. H. D. Ellis and H. W. Gell. He remarked that at this late period in the proceedings, he would not attempt to "gild the lily." Both gentlemen were excellent and useful Directors. Mr. Ellis had an experience of the Company extending so far back that he (the Chairman) dared not attempt to say how far back it was. Mr. Gell, like Mr. Ellis, brought to bear upon the business of the Company judgment and common sense which were invaluable.

Sir T. F. Victor Buxton, Bart., seconded the motion, which was unanimously carried.

Mr. Ellis acknowledged, on behalf of himself and Mr. Gell, the renewed mark of the proprietors' confidence.

Moved by Mr. W. G. Wilshaw, and seconded by Mr. O. C. Hills, the retiring Auditor (Mr. S. W. Savage) was re-appointed.

Mr. George Ennis remarked that the Chairman, Directors, and the whole staff had brought the Company through a most difficult period; and they deserved a very hearty vote of thanks from the proprietors in recognition of their work. He was sure the proprietors entirely approved of the expenditure of £11,000 in respect of the men who had gone to the war and the war bonus to the employees. Both the men who had gone to the war and those who could not go deserved their warmest thanks.

Mr. Wilshaw seconded the motion, which was heartily passed.

The Chairman, on behalf of his colleagues and himself, thanked the proprietors for the very kind way in which the vote of thanks had been proposed and received. It was, he said, a real source of gratification to the Directors as half year by half year the proprietors were pleased to express approval of the conduct of the Company; and the Board would very much miss it if this expression of approval were omitted.

Mr. Stanley H. Jones, on behalf of the members of the staff which he represented and the workmen, also thanked the proprietors very much for their vote, which he could assure them was greatly appreciated. What was said was read by hundreds of their workmen who received the report of the proceedings in pamphlet form, and to whom it would give great pleasure to see how they had been remembered by Mr. Bradshaw at the meeting. The references to the members of the staff would be greatly appreciated by them. They had lost Mr. Gill, their Assistant-Engineer; and the South Metropolitan Company had gained what they had lost. Mr. Gill's work was known perhaps more to him (Mr. Jones) than to any other gentleman in the room; and he could only say that Mr. Gill fully deserved his success in life. The Chairman had kindly alluded to the ship-owning question; and his father had also made reference to it. The modesty of the Chairman prevented him mentioning the part that he himself had had in the acquisition of the steamers. Their Chairman had, backed by the Deputy-Chairman, a very considerable "finger in the pie;" his (Mr. Jones's) own part having been merely to develop the idea. These steamers had spelt success for them in the past, and would do so in the future.

Mr. Bradfield, on behalf of the clerical staff, also thanked the proprietors for their continued confidence. He did not hesitate to say that they expected the vote, looked for it, and, if they did not get it, would very much miss it. It always encouraged them to further effort.

LIVERPOOL GAS COMPANY.

The Late Mr. Edward Allen.

The Annual Meeting of the Company was held in the offices, Duke Street, Liverpool, last Tuesday—Mr. H. Wade Deacon, the Chairman, presiding.

The report stated that for the year ended Dec. 31 the total revenue was £813,879, and the expenditure £673,392, leaving a surplus of £140,487. After deducting the amount taken for payment of the dividend declared last August, and the interest on the debenture stock and mortgages, and transferring £17,015 to the special purposes fund, there remained a balance of £96,357, out of which the Directors recommended a dividend for the half year ended Dec. 31 of 2½ per cent. on the ordinary stock. Owing to the additional cost of labour and materials occasioned by the war, the Directors had found it necessary to increase the price of gas to consumers 2d. per 1000 cubic feet, commencing with the current quarter. The Directors desired to place on record the great loss which the Company had sustained by the death, in July last, of Mr. Edward Allen, who had been in the service of the Company for upwards of fifty years, during the last ten of which he occupied the post of Engineer. In succession to Mr. Allen, the Directors appointed as the Company's Engineer Mr. Ralph Ernest Gibson, who has been upwards of ten years in the service of the Company as Assistant-Engineer.

The accounts accompanying the report showed that the total capital paid up and added on conversion at Dec. 31 was £2,498,905, out of £3,098,905 authorized; leaving £600,000 remaining to be issued. The amount raised on loan at the same date, including premiums, was £486,219, out of the £750,222 authorized; leaving £264,003 unissued. The capital account shows that (including the amount added on conversion) £2,985,123 has been raised, and £2,128,877 spent. In the course of the year, a sum of £19,697 was spent on new buildings, manufacturing plant, machines, storage works, &c. The reserve fund stood at £128,712, the special purposes fund account at £17,015, and the co-partnership bonus and savings at £22,277 at the close of the year.

Revenue Account.—*Income.*

	£ s. d.	£ s. d.
Sale of gas—		
Per ordinary meters at 2s. 1d. per 1000 cubic feet	416,428 2 1	
Per automatic meters at 2s. 8d. per 1000 cubic feet	195,141 15 8	
Public lighting at 1s. 10 5d. per 1000 cubic feet	21,756 18 3	
		633,326 16 0
Rental of meters	12,513 6 3	
,, fires and cookers	13,789 19 2	
Residual products—		26,303 5 5
Coke (*Less* expenses)	88,394 11 9	
Tar ,, ,,	28,346 5 0	
Ammoniacal liquor ,, ,,	34,084 16 11	
Other products ,, ,,	2,844 2 7	153,669 16 3
Rents		100 0 0
Fittings		479 4 1
		813,879 1 9

REVENUE ACCOUNT.—*Expenditure.*

	£ s. d.	£ s. d.
Manufacture of gas—		
Coals, including oil, dues, carriage, unloading, and all expenses of depositing same on works	346,491 0 1	
Purifying materials, water, and sundries	9,435 15 10	
Salaries of Engineers and Superintendents and officers at works	8,988 5 7	
Wages and gratuities at works	55,599 5 7	
Repairs and maintenance of works and plant (including renewal of retorts), machines, apparatus, tools, materials and labour, *less* old materials	88,748 1 0	
		509,262 8 1
Distribution of gas—		
Salaries of Surveyors, Chief Inspector, Inspectors, Assistant Inspectors, &c.	16,746 9 3	
Repair, maintenance, and renewal of mains and service pipes, including materials, laying, paving, and labour	16,191 9 3	
Repairing, renewing, & refixing meters	22,105 19 5	
" " " fires and cookers	20,170 7 10	
		76,114 5 9
Public lamps—		
Lighting and repairing	..	1,972 0 5
Rates, taxes, and rents—		
Rents	694 15 1	
Rates and Taxes	37,979 15 1	
		38,674 10 2
Management—		
Directors' allowances	2,000 0 0	
Salaries of Secretary, Accountant, and clerks, office keepers, and messengers	10,205 8 2	
Collectors' commission and salaries	7,691 8 1	
Printing, stationery, and advertising	3,258 0 5	
General establishment charges and incidentals	3,321 0 11	
Shareholders' Auditors	21 0 0	
Official Auditor	256 5 0	
		26,733 2 7
Special charges—		
Law and parliamentary charges	1,964 7 3	
Contributions to officials' superannuation fund	3,109 14 0	
Moiety of superannuation to old officials	2,706 0 7	
Co-partnership bonus	8,711 3 5	
Bad debts	347 13 5	
Insurances and compensations	3,796 7 4	
		20,635 6 0
		673,391 13 0
Balance carried to net revenue account		140,487 8 9
		813,879 1 9

Statement of Coal and Oil.

Description.	In Store Dec. 31, 1914.	Received.	Carbonized or Used.	In Store Dec. 31, 1915.
	Tons.	Tons.	Tons.	Tons.
Common	44,660	289,690	296,483	37,867
Cannel	716	9,842	8,945	1,613
Total	45,376	299,532	305,428	39,480
Gas oil—gallons	354,445	5,376,754	5,015,087	716,112

Statement of Residual Products.

Description.	In Store Dec. 31, 1914 (Estimated).	Made (Estimated).	Used in Manufacture (Estimated).	Sold.	In Store Dec. 31, 1915 (Estimated).
Coke—tons	11,401	199,172	37,969	171,994	610
Tar—gallons	273,768	4,354,547	17,169	4,146,028	465,118
Ammoniacal liquor—gallons	702,585	9,371,195	*Nil*	9,585,840	487,940

The CHAIRMAN, before proceeding with the ordinary business of the meeting, said: I wish to emphasize the paragraph in the Directors' report in which reference is made to the death of Mr. Edward Allen. Mr. Allen had spent the whole of his business life in the service of the Company. He entered it as a youth, and had, by dint of hard work, and by his natural ability, risen to the highest position the Company had to offer. Some of my colleagues had known him for a longer time than I had; but all who knew him at all well were impressed by the simplicity of his life and by the absolute integrity of his character. He was a very able professional gas engineer—one upon whose advice the Directors came to rely with great confidence, and in whose judgment they placed much reliance. He did his work thoroughly, and with his whole energy; and while he was a man of strong convictions, and could uphold his opinions in argument, he was a most pleasant man to work with. He was an admirable official of the Company; and he had the power of working well with all under him. By his courtesy and fair-mindedness, he had gained the respect, and I believe the esteem, of all the men in our works. His abilities were recognized by his professional brethren; and he had had the honour of filling the office of President of the Institution of Gas Engineers. At the time of his death, he was one of the members of a small committee of gas engineers appointed to secure for the Government the largest possible production of toluol by the gas undertakings of the country. If I may be allowed to strike a more personal note, I should like to say that I felt his death as the death of a friend. He was appointed Engineer at the same time that I was elected by my colleagues as Chairman; and naturally we were brought into close relationship with each other. I trusted him thoroughly; and for the ten years of our working together, I found him loyal to the core.

Proceeding to move the adoption of the report and accounts, the Chairman remarked that there were no comparative figures to which he had to draw attention, because this was the first year that they had had a full twelve months' working under the new conditions. Like every other company, they had been affected by the war. It had made difficulties for them in many ways; and he was glad to think that they had been able to do something to help the country by the extraction of toluol from the gas. At the request of the Government, they had put in the necessary plant. This had been of no advantage to the Company, from the money point of view. The difficulties were increased owing to the decreased supply of coal, and the reduced facilities of the railway companies for delivery. The question of the supply of coal had caused the Directors and officials a good deal of anxiety; but they had managed to get on so far in a satisfactory manner. At the end of the year, the Board came to the conclusion that it was necessary to increase the price of gas 2d. per 1000 cubic feet, making it 2s. 3d. He could tell the shareholders the Company were in a very good position, and the works were excellently maintained to meet every requirement. There had been a considerable increase in the sales of gas during the past year; but from various causes they might in the near future experience a reduction. With regard to capital expenditure, they applied to the Treasury for an increase of capital, and were allowed to raise £37,500. There had been about £20,000 of capital expenditure for new buildings and plant; and they had also completed the purchase of the Fazakerley undertaking from the Corporation, which was rather a unique thing for a company to do. For this transaction the amount of £15,000 appeared in the balance-sheet; and the Directors would decide how much of it would be charged to capital and how much to revenue. The cost of both labour and materials had increased, and the works had to be carried on with a depleted staff—409 of their men having joined the Colours, and more would go. Eleven men had lost their lives. The cost of war allowances and bonuses amounted almost to 1d. per 1000 cubic feet of gas. The co-partnership scheme continued to work well. In view of possible air raids, the Company had insured their property. They had also arranged with the military authorities in case of danger to reduce the pressure of the gas [*ante*, p. 379]. He thanked the officers for their loyal service. For the first time in the history of the Company they had had to employ women clerks; and he thought they were going to work very well.

Mr. J. E. TINNE seconded the resolution.

Major W. B. PEARCH asked on what authority the Board had introduced the sliding-scale into their Bill. He suggested that the shareholders make an application to the Board of Trade for an inquiry into the state of the Company and into the management.

Mr. G. H. BALL (a Director) said he had disagreed with the rest of the Board on the introduction of the sliding-scale. The effect of the sliding-scale, he contended, might be to lower the statutory dividends on the faith of the maintenance of which he and other shareholders had bought stock at a high price.

The CHAIRMAN explained that when the Bill was before Parliament it was considered advisable to concede the sliding-scale, as most other large companies had done, in face of the opposition of the Liverpool Corporation and the Labour party. The terms agreed to were not inequitable; and but for the war the price of gas would probably have fallen below 2s. 1d., and a slight increase of the statutory dividend would have been allowable. Under the same circumstances, he felt that he should act exactly in the same way again. The Directors were satisfied with the position of affairs, and as far as he knew the shareholders were. ["Hear, hear."]

Major PEARCH withdrew any further criticism, and the report was adopted; a vote of thanks being passed to the Board.

NEWCASTLE AND GATESHEAD GAS COMPANY.

Annual and Extraordinary Meetings.

At the Annual Meeting of the Company last Tuesday, the report of the Directors, which was given on p. 320 of the "JOURNAL" for the 8th inst., was adopted, and dividends were declared at the rates of 4 per cent. per annum on the preference stock and 4½ per cent. per annum on the ordinary stock.

The CHAIRMAN (Sir William H. Stephenson) said that coal had cost £210,135, an increase of £2627, and the quantity carbonized had increased by 20,527 tons. The sum of £8300 had been paid to workmen as a war bonus, to meet the additional cost of living. Gas sold to private consumers yielded £360,391—an increase of £50,665. There was a decreased consumption in respect of public lighting; but, on the other hand, the use of gas for industrial and other purposes had more than compensated for decreased sales in some directions. By arrangement with the Government, a more than ample supply of coke at less than pre-war prices had been reserved for the public during the winter. Their express motor-waggons had proved exceedingly useful. The net revenue carried forward to this year was £11,423—an increase of £5344. The Directors were advised that the profits of the Company for 1914 would not be subject to excess profits duty under the Revenue Act of 1915. The year's working had been very satisfactory indeed, especially when they took into consideration the unparalleled conditions which had prevailed during the whole of the period. Of their employees, 475 had joined the Colours. Of these, 234 were now on active naval or military service, some 190 had left the service of the Company to work in the manufacture of munitions, and 204 had attested under Lord Derby's scheme. This, out of a total of about 1593 males employed immediately preceding the war, worked out to a contribution of 54 per cent. of the Company's men. They had been materially assisted by the employment of females. He gratefully acknowledged the loyal working of the staff and employees under exceptionally difficult circumstances.

THE COMPANY'S BILL.

At the close of the general meeting, there was an extraordinary meeting, at which the consent of the proprietors was given (with three dissentients) to the Company's Bill, the principal object of which is,

as already pointed out in the "JOURNAL," to remove restrictions on the Company's financial powers, and to enable the Company when necessary to raise money on the best terms obtainable.

The CHAIRMAN said the necessity for the Bill arose from the serious alteration in the value of money brought about by the war. As their Acts stood, the restrictions on the Company were such as to make it almost impossible for them to raise money on proper terms. The Company at present had power to raise new capital by (1) ordinary stock, (2) 4 per cent. preference stock, and (3) debenture stock not exceeding 4 per cent.—the latter to a total not exceeding one-third of the amount of money for the time being raised by ordinary and preference stock. What had actually been issued was 3½ per cent. debenture stock. They had power to raise £378,383 by ordinary or preference stock and £159,800 by debenture stock. With a dividend of only 4¼ per cent. on the ordinary stock, however, the Company could not hope to make an issue, excepting at a large discount, while the Government were issuing Exchequer bonds running for five years bearing interest at 5 per cent. It was clear that, to raise money, stocks bearing a higher rate of dividend or interest than was within the Company's present powers must be issued. The Bill also authorized the Company to raise the maximnm dividend of any preference stock to be hereafter issued from 4 to 7 per cent., and to make the stock redeemable. While 7 per cent. was suggested as a maximum, the Direectors hoped that a less percentage might prove sufficiently attractive. Their view was that redeemable debenture stock would prove the cheapest and most attractive form of security; but much depended on the future action of the Government, as this would virtually regulate the market price of money. The Bill further proposed to substitute a calorific standard for the present candle-power standard as the test of the gas. The incandescent burner was now in use by about 99 per cent. of the Company's consumers.

Sir WALTER PLUMMER remarked that no one could see what the financial future would be; but while 7 per cent. was inserted in the Bill, it was not expected that this figure would ever be reached.

BRISTOL GAS COMPANY.

The report of the Directors which was adopted at the meeting of the Bristol Gas Company last Thursday stated that the revenue account for the year ended Dec. 31 was very satisfactory, showing a profit balance of £106,136. After paying interest on the debenture stock and a dividend on the general capital stock, there was a balance of £90,775 to be carried to the credit of the current year.

The CHAIRMAN (Mr. Fenwick Richards) said expenses all round were going up. Coal, carriage, and unloading were £20,000 more than in the previous year; and this extra sum had been incurred between August and December, 1915. During the previous seven or eight months of the year, coal was supplied at the contract prices of 1914. The prices of everything for the manufacture of gas had increased—not only coal and oil, but all the other things. In some cases people declined to supply goods on contract for twelve months, or even six months; and they had had to buy at the prices of the day. Allowances to workmen on active service appeared for the first time in the accounts, though they were mentioned at the last meeting. Of their men, 108 had gone to the front; and they were doing all they possibly could for them from a monetary point of view—making up the sum they received from Government to their full pay, so that their wives and dependants might not suffer. He regretted to say that they had heard of the deaths of six of these men. Eleven of their office staff had also joined the Colours. Among this number, there had been two losses; and two more had been invalided home. They were paying half the salaries of those from the office staff who had joined the Colours; and they hoped that those who were invalided might recover, and be able to return to their work again. They were valuable officers; and they missed them very much indeed. Turning to the credit side of the accounts, the amount received for the sale of gas was considerably more than it was a year ago; and this was chiefly owing to the increase in price from 2s. to 2s. 6d. per 1000 cubic feet. The sum was also increased to a small extent by the additional quantity of gas which had been made; and this, he thought, was very satisfactory, considering all the difficulties they had had to contend with. The additional money received from residual products had been the one relief from the anxiety and trouble they had had to contend with on the debit side. Coke figured at £20,000 more, which was very satisfactory.

Mr. J. F. EBERLE, in acknowledging his re-election as a Director, remarked upon the splendid manner in which the staff had helped to carry on the business, though they were shorthanded in many ways. This was delightful to the Board, and reflected the greatest credit on the staff.

A dividend was declared for the past half year at the rate of 5 per cent. per annum.

Smaller Street-Lamp Burners.—The Camberwell Works Committee have been in communication with the South Metropolitan Gas Company as to the fitting of smaller burners to the street-lamps, which will give an illuminating power equal to 50 candles (consuming 2 cubic feet of gas per hour), with a reduction upon the present cost. The Committee have arranged for 250 lamps to be fitted with the new burner for experimental purposes, and will report further in due course.

Ilfracombe Gas Company.—The annual meeting of the Ilfracombe Gas Company was held last Saturday week—Mr. W. C. Rafarel presiding. The Directors reported an available balance of £2504, after paying an interim dividend of 2½ per cent. on the preference and consolidated ordinary stocks. The Directors recommended a further payment of dividends at the same rate, making the full statutory dividend for the year. The Bill presented to Parliament last session received the Royal Assent on May 19; and the beneficial effects were already being experienced. In consequence of the absence of visitors and the restrictions of public lighting, there was a decrease in the sale of gas equal to 5 per cent. Notwithstanding this, however, they had not increased the price. The report was adopted.

SHEFFIELD UNITED GAS COMPANY.

Report and Accounts.

The report of the Directors, which will be submitted to the shareholders on the 13th prox., states that the gas sold during the twelve months ended Dec. 31 shows an increase of 269 488,000 cubic feet, or 5·75 per cent., over 1914, though there was a decrease in the quantity supplied for the public lamps of 106,548,000 cubic feet. The usual interim dividend of 5 per cent. was paid for the half year to June 30. The accounts now presented show that, after providing for the dividend for the remaining six months of 1915, there will be a balance of £8714 to be added to the amount previously carried forward. The cost of all materials used by the Company has risen considerably. This, coupled with the very serious increase in the price of coal, compelled the Directors to raise the charges for gas by 6d. per 1000 cubic feet from July 1 last. The average price at which gas was sold during the twelve months was 1s. 4·25d. per 1000 cubic feet.

The accounts accompanying the report show that the revenue from the sale of gas was £332,350; rental of meters and stoves, £23.331; and residual products, £214,722—miscellaneons items bringing up the total to £574,105. The following are the principal items of expenditure: Manufacture of gas, £380,945; distribution, £38,470; management, £16,423; rents, rates, and taxes, £20,595—miscellaneous items (including £2359 paid to the families of men who have joined the Army) making up a total of £463,446; leaving £110,659 to be carried to the profit and loss account.

SWANSEA GASLIGHT COMPANY.

Last Wednesday the annual general meeting of the Swansea Gas Company was held, when the Chairman (Mr. John Glasbrook) spoke of the largely increased prices the Company had to pay for practically all the commodities purchased during last year. He instanced gas oil as representing an increase of over 100 per cent.—principally due to the increase in freights from America. The receipts from the residual products, although not so good as before the war, were improving. The Company during the year fixed over 1000 gas-fires and some 1500 cookers, which was easily a record for any year. The effect of this had been to maintain the total consumption of gas as compared with the previous year, in spite of a 70 per cent. reduction in the gas used for public lighting and other reductions in consumption due to early closing and domestic economies. The Board had encouraged its employees to enlist; and about 80 per cent. of the staff of military age had either directly enlisted or attested. As to the increase in the price of gas, he stated that the principal contributory item was increased wages and generally the continual upward tendency in cost of practically all materials, which would collectively amount to an advance of not less than 40 per cent. The public were well aware of these facts, and would appreciate that a consequent increase in the price of gas was inevitable. The South Wales coals were not so suitable for gas-making purposes as those in the Midlands and the North of England, which produced about 25 per cent., or about 2500 cubic feet, more gas per ton; and this, obviously, was an important factor controlling the price of gas.

The usual resolutions were passed unanimously.

DERBY GAS COMPANY.

Annual Meeting.

In the absence of the Chairman (Colonel G. Gascoyne), Alderman J. W. Newbold presided over the meeting of the Company last Friday, and, in moving the adoption of the report [*ante*, p. 376] and statement of accounts, said that up to the present time 120 members of the staff and employees had joined the forces; and all those of military age became duly attested under Lord Derby's scheme. One member of the staff and two employees had unhappily lost their lives. The total expenditure on manufacture during the past year amounted to £122,289—an increase of no less than £26,502 on the previous year. Coals had cost £14,742 more. Repairs and renewals were £11,765 more, owing to the carrying out of certain work which the Company, on the advice of their Engineer (Mr. J. Ferguson Bell), had considered to be necessary. The principal item comprised three-fifths of the cost of the vertical retort installation at the Cavendish Street works, to replace horizontal retorts. The working results clearly indicated that there was every reason to be satisfied that the large expenditure incurred during recent years in replacement of obsolete plant had been a wise expenditure. The Board had thought it advisable to insure the three works and offices against aircraft raids. Notwithstanding the restrictions on lighting, more gas had been sold than ever before in the history of the Company. The increased revenue from the sale of gas was £10,235—due partly to the increased quantity sold, and partly to a small addition to the price, which involved a reduction of ¼ per cent. in the dividend. Residuals realized £16,659 more; and the total result was a gross profit of £33,159, as compared with £34,499 for the preceding year. These were not times for festive gatherings, so the Board decided simply to announce from the chair that at the close of the meeting the new show-rooms would be open to the public. They extended to all consumers and others a cordial invitation to visit the new premises, and inspect the latest appliances for use of gas under the best conditions, so as to obtain the highest efficiency. He thought the shareholders would agree that great credit was due to their Architect—Mr. Thorpe—and the various contractors for the skilful manner in which they had carried out what he was informed was a new departure in show-rooms. The expansion of their already large business necessitated an enlargement of the offices; and the Board decided that they would at the same time erect new show-rooms in harmony with present-day requirements. He felt quite sure the

shareholders would approve the policy in having a show-room to justify its title.

The report was adopted, and the standard rate of dividend was declared on the consolidated stock at the rate of 5 per cent. per annum for the half year ended Dec. 31 last, with an additional ¾ per cent. for the whole year, making 5¾ per cent., less income-tax.

Replying to a vote of thanks to the staff and employees, Mr. Bell remarked that never in the history of the Company was this more deserved than now. He was glad that so many of the employees had responded to the country's call.

PLYMOUTH GAS COMPANY'S BILL.

A meeting of shareholders of the Plymouth Gas Company was held last Thursday—Sir Joseph Bellamy in the chair—when approval was given to the Bill which is being promoted this session.

At a meeting of the Plymouth Town Council yesterday week, the Gas Committee reported that a Sub-Committee had considered the provisions of the Bill, and a report by Mr. Isaac Carr (the Consulting Engineer) with regard to it; and they recommended that the proposed agreement with reference to the disposal of tar from the Devonport Gas-Works be not acquiesced in, as not being either to the financial advantage of the Corporation or to the benefit of the Ministry of Munitions. Also that the Company be informed that the Corporation would be prepared to entertain a proposal to sell tar upon a sliding-scale basis of payment. The report was adopted; and the Council confirmed a recommendation of the Gas Committee that the matter be left in the hands of the Sub-Committee, with power to act.

It is understood that the Corporation will appear as opponents of the Bill in the House of Lords, and that their opposition will be directed, among other things, to the clause relating to the adoption of a calorific standard for the gas supplied by the Company.

PIONEERS OF GAS IN PRESTON.

Some notes on Father Dunn and Mr. Isaac Wilcockson appear in the "Preston Guardian;" it being stated that they were both well known men in their day, who were much associated with the development of Preston. They were, it is said, the pioneers of gas lighting in the town, which was the first provincial one to be lighted with gas. This was just a hundred years ago. The Parish Church was the first place of worship in England lighted with gas; Horrocks, Jacson, and Co.'s was the first cotton mill to use the illuminant; and Fulwood Barracks was the first Government barracks to adopt the system. The Rev. J. Dunn, S.J., has been called the "father of the gas-works." He was instrumental in the formation of the Preston Gas Company, which was established in 1815; and he was connected with it up to the time of his death.

Portraits of both these pioneers are given; and it is remarked that that of Mr. Isaac Wilcockson is reproduced by permission of Mr. Samuel Tagg, the Manager of the Preston Gas Company, from an oil painting now hanging in the Board-room. He was associated with Father Dunn and others in the establishment of the Company—being successively Treasurer and Chairman. He filled the office of Trustee and Director for about 45 years. In 1860, the Directors, desiring to show their respect and esteem for him, had his portrait painted; and it was hung in the offices by the side of that of Father Dunn. In 1863, he resigned the chairmanship and his seat on the Board, on account of his age, and died the following year.

LIGHTING CONTRACTS AND THE WAR.

Referring in their last week's issue to the recently-tried action of "*Leiston Gas Company v. Leiston Urban District Council*" [*ante*, p. 314], our contemporary "Engineering," after recounting the main details of the case, made the following remarks.

A point deserving of special notice, upon which the learned Judge laid due stress, is this: That the contract in so far as the Gas Company were concerned was partly executed; they had provided the plant and supplied the lamps. Those who desire to cite this case as an authority for the proposition that in all cases where the lighting of lamps is prohibited the bill of a gas or electric lighting company must be paid, should specially note this point. There are probably many cases where lighting companies are bound to provide light *simpliciter* (whether as electric energy or coal gas), without providing anything in the nature of plant. Can it be said, in such a case, that the local authority must pay for light which, owing to the making of a restriction order, it has never used?

Much depends upon the terms of the contract. Suppose it was to supply "such quantity of gas [or electricity] as may be necessary to light the streets of Slocum-on-the-Mud at 2s. per 1000 cubic feet [or 1½d. per unit] for the space of five years," can it be said that the intervention of a lighting order, preventing the lamps being lit, would enable the gas company to sue for anything? It is submitted that it could not, although it is quite possible that the "town lighting" may have made it necessary to instal or retain certain expensive machinery.

Now let us introduce another term. Suppose the contract is as above, but subject to a minimum "rent" of so much per burner or lamp per annum. In that case, if lighting were stopped by a military order, the local authority might say that the contract was entered into on the footing that the streets were to be lit as in normal times, and refuse to pay even the minimum.

That they might so refuse seems to follow as a logical deduction from the well-known case of "*Krell v. Henry*" (1903), 19 T.L.R., 711, which arose in consequence of the postponement of the coronation. A man had agreed to let his flat for £75 in Pall Mall on two days, to "view the coronation." The function having been postponed, the "tenant" refused to pay anything. The Court of Appeal held that he was not liable, on the ground that when the contract was made it was not within the contemplation of the parties that the procession would not take place. They held, in effect, that it was an implied condition that the procession would take place. By a parity of reasoning, in the supposititious case above mentioned, it is an implied condition that the street lighting shall be normal during the currency of the agreement. If war supervenes and makes performance impossible, it is submitted that the gas company could claim nothing.

Had it not been that in the case before Mr. Justice Low the contract was partly executed, there must have been judgment for the defendants; and one may be permitted to doubt whether the proper course would not have been to direct an inquiry as to how much of the sum claimed was due "on capital account" and how much for the supply of gas.

The subject is a difficult one; and there are hardly any authorities bearing upon it. There is one case (not cited to Mr. Justice Low) which may usefully be referred to. There an attempt was made (in 1893) to avoid payment for gas to be supplied at so much per lamp on the ground that certain lamps were not lit. By a local Act, the charge for supplying gas to the public lamps at Richmond, including the providing and use of such lamps, "shall be £4 5s. per lamp per annum, subject to an increase or reduction of 5s. per lamp per annum for every increase or reduction of 3d. per 1000 cubic feet to the ordinary consumer within the said parish; the said lamps to be lighted from sunset to sunrise, and the burners used therein to consume not less than 5 cubic feet of gas per hour." During certain months it frequently happened that many of the public lamps in Richmond were not kept alight during the prescribed period—the admitted cause being severe frost. The Gas Company made special efforts to overcome the difficulty. The Richmond Corporation contended that the Company were not entitled to recover the full statutory charge, but only such sum as might be reasonable, having regard to the gas actually provided. It was held that full effect could only be given to the Statute by treating the £4 5s. per lamp per annum as a lump sum to be paid by the Corporation, which could not be apportioned or divided, and that it was no answer to say that the lamps were not alight during the whole of the prescribed period by reason of a cause admittedly inevitable [*re* "*Richmond Gas Company v. Mayor of Richmond*" (1893) 1 Q.B. 56].

In that case it will be noticed that the Gas Company were to provide the lamps as well as supply them with gas; so it is on all-fours with Mr. Justice Low's decision. Enough has, however, been said to show that the case of Leiston must not be relied on to establish a proposition which is too broad.

Toluol Extraction at Wombwell.

On the submission of the minutes of the Gas and Water Committee at a recent meeting of the Wombwell Urban District Council, the Chairman (Mr. J. E. Mitchell) stated that the toluol extraction plant lately installed by the Council at the gas-works, for the purpose of taking from the gas materials for the manufacture of high explosives, was now at work; and Wombwell had the distinction of being the first authority in England to engage upon such operations by this particular process. The Chairman of the Council (Mr. A. E. Allott, J.P.) remarked that great credit was due to Mr. Mitchell and to Mr. P. D. Walmsley, B.Sc. (the Gas Engineer and Manager), for their initiative in the matter. The plant was capable of dealing with more than their own requirements, so that they might hope to become a central receiving depôt, dealing with material sent to them by neighbouring undertakings. The plant here referred to has, we understand, been designed by Mr. Mitchell and Mr. Walmsley for washing out of the gas the whole of the benzol and toluol, and its subsequent removal from the washing medium in the form of crude benzol. This crude benzol is at present being sent away to a neighbouring plant for rectification; but it is the intention of the Council eventually to instal a rectification plant of their own, so as to supply pure toluol and pure benzol. By the process now adopted at Wombwell, it is hoped to recover quite easily four times as much benzol and toluol as was recovered previously.

Farmers and Sulphate of Ammonia.

In the course of a practical demonstration on the manufacture of sulphate of ammonia at the New Brancepeth Colliery, following on a course of lectures, Mr. F. P. Walker, the Adviser in Agriculture to the Armstrong College, said that fortunately sulphate of ammonia was a home product, and there was a very full supply of this most valuable source of nitrogen. Usually it was exported in enormous quantities to countries which fully recognized its great value as a fertilizer. For the present, its exportation had been stopped, and the price for February at the works fixed at £16 10s. a ton. If, however, prevention of exportation was to be continued, it was only reasonable that manufacturers should receive from the farmers as early intimation as possible of what quantities they would require. The earlier the delivery could be effected, the better; for in March, April, and May, when it would be urgently wanted, railway facilities were likely to be further straitened through the demands of the war. As there was plenty of room for the greatly increased use of quick-acting nitrogenous manures on innumerable farms, he strongly urged farmers to give the matter their most serious attention. Sulphate of ammonia was at the present time one of the cheapest sources of nitrogen, and, weight for weight of nitrogen in the other forms of artificials, would give equally good results, and in some cases better. One of the secrets of the successful use of sulphate of ammonia was its early application; and its great advantage was that it could be used either when sowing the seed or as a top-dressing. Another point he would strongly emphasize was that in the use of quick-acting nitrogenous manures generally it was most essential to keep crops growing by their use, as distinct from waiting for the crop to show serious signs of failing before applying them.

A fire at the house of the Duchess of Bedford in Berkeley Square (by which it appears that her bedroom was practically burnt out) is said to have been caused by the fusing of an electric wire.

NOTES FROM SCOTLAND.

Edinburgh Corporation and Automatic Gas Lighting.—As stated last week [*ante*, p. 379], a Sub-Committee of the Cleaning and Lighting Committee of the Edinburgh Town Council paid a visit to Messrs. Alder and Mackay's works, where a demonstration was given of the firm's automatic system of lighting and extinguishing street-lamps. A meeting of the Committee was held on the 14th inst., at which the Sub-Committee recommended that the experiment be made in two districts, one to be selected by the Corporation and the other by the Gas Commissioners. The recommendation was approved, and was remitted to the Sub-Committee to carry out. It was stated that the Gas Engineer (Mr. Alexander Masterton) is engaged in testing the various district governors. The Convener of the Committee (Judge Stark), who is also a Gas Commissioner, is confident that the experiment will be successful, and that the system will ultimately be applied to the 10,000 gas-lamps in the city, and so effect a saving of from £2000 to £2500 per annum. The lamplighters, afraid that their occupation is seriously threatened, held a private meeting recently, with what result is not known.

Alloa Vertical Retorts.—The Alloa Corporation Gas-Works have benefited considerably by the placing in position of the new vertical retorts. The saving in coal and the additional revenue from the residuals have enabled the Town Council to lower the charge for gas to all classes of consumers by 2d. per 1000 cubic feet. To domestic consumers the rate per 1000 cubic feet is 2s. 5d. The Engineer and Manager of the works (Mr. J. W. Napier) gave some very interesting particulars of the installation in a paper he read in Edinburgh last Wednesday—see *ante*, p. 407.

A New Lighting Order for Glasgow.—A new lighting order to come into force next Friday will reduce the output of gas in Glasgow. Streets, factories, workshops, and dwelling houses are all affected, and less light will be seen anywhere, as the order is a severe one.

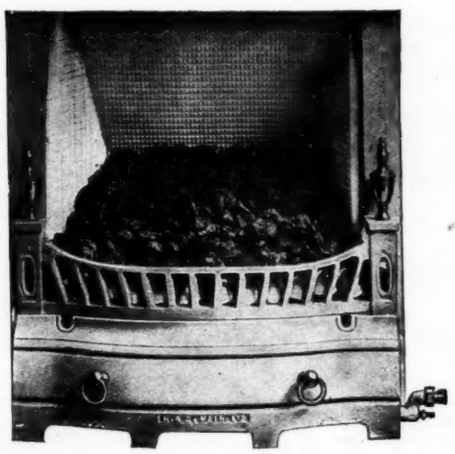
A New Company at Stranraer.—A Company just formed is that of the Stranraer Gas Company, Limited. The capital is £13,000, in £1 shares; and the new concern takes over the works and assets of the Sanquhar Gas Company.

Gas-Works Troubles at Perth.—The report of Mr. John Lambert, the Burgh Electrical Engineer, in connection with the breakdown of the machinery at the gas-works, has been again referred to in the Perth Town Council. The trend of Mr. Lambert's observations was indicated in the "JOURNAL" for the 8th inst. [p. 324]. At the close of his report, he said: "Owing to the large amount of plant at the gas-works, and the somewhat trying conditions under which it is running, it will be necessary to bestow upon it much more attention in the future, if good results are to be obtained and breakdowns minimized. I have no hesitation in saying that many of the electrical troubles have been caused to a great extent by want of thorough examination; and this can be attributed to the difficulty (in some cases almost impossibility) of getting at the motors and other apparatus." The Emergency Sub-Committee (at whose request the report was made) recommended, and the principal Committee and Town Council adopted the report, and remitted it back to the Sub-Committee with powers to arrange, along with the Gas Manager (Mr. David Vass) and the Electrical Engineer, to carry out the detail of the work and additions to the plant referred to in the report, in such manner as to cause as little interference as possible with the gas supply.

A Discussion in the Council.—Lord Provost Scott presided at the monthly meeting of the Perth Town Council, which took place on Monday evening of last week; and during the proceedings some strong criticism was made upon the management at the gas-works, following upon the report prepared by the Electrical Engineer, which has just been referred to. Ex-Treasurer Rollo said he did not think the matter could be passed over without something being said on the subject, because it was a very strong report. It seemed that there was no one looking after the electric stoking plant at the gas-works. Was the Gas Manager to be allowed to go without a reprimand from the Council in face of a report like this? It was a disgraceful state of affairs; and the report clearly showed there was something radically wrong. Approval of the minute embodying the report having been moved, ex-Treasurer Rollo moved disapproval of it, saying he was prepared to go a little farther. After reading the report over, he felt there had been a good deal of carelessness on the part of the Manager in not looking after the electric plant. Everything appeared to want renewal, and it seemed that Mr. Vass had not been attending to the electric plant, while they had nothing to prove that he had been looking after the other parts of the machinery. There was not the slightest doubt that matters were in a disgraceful state; and now was the time to call the Manager to book. He was going to move, whether he got a seconder or not, that they ask Mr. Vass to send in his resignation, or that they give him three months' notice. Ex-Bailie Macpherson asked if Mr. Rollo's motion was a competent amendment to departmental work which had been undertaken by the Emergency Committee, who were appointed by the Town Council to do this kind of work. The standing orders having been referred to, the Lord Provost said it was clear that the character of their officials had to be safeguarded to a certain extent; and while he did not deny Mr. Rollo's right to raise the question of the dismissal of Mr. Vass, he thought that he should give notice of motion. It would be more satisfactory. At the close of the meeting, Mr. Rollo gave notice of motion—"That the Gas Manager be asked to send in his resignation."

The Richmond Gas Stove and Meter Company, Limited, have designed a folder advertising the "R. H. D." semi-circular fronted gas-fire, which they claim to be "the first and only gas-fire on the market distributing heat to all parts of the room." There are illustrations of the main lines of radiation emitted.

THE MAIN GAS FIRES.



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CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Feb.* 21.

In tar products the position generally presents no new feature. It is stated that the possibility of utilizing pitch for gas making is being examined in various parts of the country, and the prevalent view is that for such purpose pitch is worth coal price. For export, makers still quote pitch at 19s. to 19s. 6d. per ton net in bulk at works. Creosote remains steady at 4⅛d. net in bulk; while solvent naphtha and various forms of naphthalene are in strong demand.

With regard to sulphate of ammonia, notwithstanding the serious inconvenience caused by the temporary stoppage of export licences, the market export value is unchanged at £17 5s. net per ton, filled into buyers' bags at sellers' works for 25 per cent. quality. After supplying the home demand, there is no doubt that stocks are accumulating at makers' works, which is damaging to the sulphate industry both at home and abroad, where our Allies need the material for agricultural purposes.

Tar Products in the Provinces.

Feb. 21.

The markets for tar products remain about the same. Pitch is still very quiet, and transactions are few and far between. Creosote is weaker, and sales are reported at lower prices. Solvent and heavy naphthas are in good demand.

The average values of gas-works products during the past week were: Gas-works coal tar, 16s. 9d. to 20s. 9d. Pitch, East Coast, 15s. to 16s. per ton; West Coast, 14s. to 14s. 6d. Manchester; 15s. to 15s. 6d. Liverpool; 17s. to 17s. 6d. Clyde. Benzol, 90 per cent., North, 10½d. to 11⅛d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha, in bulk, North, 6½d. to 7d. Solvent naphtha, naked, North, 2s. 1d. to 2s. 2d. Heavy naphtha, naked, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 2¼d. to 2⅝d. Heavy oils, in bulk, 3¾d. to 4d. Carbolic acid, 60 per cent., East and West Coasts, 3s. 4d. naked. Naphthalene, £18 to £28; salts, 80s., bags included. Anthracene, "A" quality, 2d. to 2½d. per unit; "B" quality, nominally ¾d.

Sulphate of Ammonia in the Provinces.

LIVERPOOL, *Feb.* 19.

The market has remained without alteration throughout the week, and at the close the quotations are £16 17s. 6d. per ton f.o.b. Hull, £17 per ton f.o.b. Liverpool, and £17 5s. per ton f.o.b. Leith. The export area is limited by the action of the Government, and supplies have been ample to cover all actual requirements. Nothing of importance has transpired in the forward position; producers being inclined to wait the effect of the restrictions of exports, and exporters being unwilling to pay any substantial premium on prompt prices.

Nitrate of Soda.

The market remains firm at 16s. 9d. per cwt. for ordinary quality, and at 17s. 9d. for refined.

Sulphate of Ammonia.

From another source, it is stated that the prices are as last week. Outside London makes, £16 12s. 6d.; Hull, £17 5s.; Liverpool, £17 7s. 6d.; Leith, £17 7s. 6d. to £17 10s.; Middlesbrough £17 7s. 6d.

COAL TRADE REPORT.

Northern Coal Trade.

The northern coal trade is active, but delay of steamers is impeding trade, though shipments continue fairly good in the circumstances. In the steam coal trade, the prices are generally firm, and more especially so for early delivery. Best Northumbrian steam coals are strong generally; but the quotation is now from 30s. to 32s. 6d., according to the time of delivery. Second class steams are 25s. to 30s. per ton; and steam smalls are quiet at 13s. to 17s. per ton. The output is fairly maintained; but new regulations as to foreign-trading vessels, and as to the export of unscreened coals to neutral countries, make forward trading difficult, so that there is not the contracting ahead that is usual at this season. It will be seen, however, that prices remain at the recent advance. In the gas coal trade, best Durhams are from 25s. per ton f.o.b.: second-class gas coals are about 24s. per ton; and "Wear Specials" are from 25s. to 26s. per ton f.o.b. The freight market is quiet, with fewer transactions; but the Tyne to London rate is near 14s. 6d. Gas coal to Havre is still quoted at 30s. for freight from our local ports. Some of the large producers of gas coal in Durham complain of the very limited output after the Government's requirements are met, so that there is little free for sale, and thus the high prices named only apply to small quantities sold. The deliveries under contract will, however, be reduced in some cases after the end of this month. Possibly this is one of the reasons why some sellers ask higher figures than those quoted for gas coals, and thus the values are a little irregular, both for best gas coal and for some other Durham kinds. In coke, values are well maintained. There are tolerably full exports of gas coke, the quotation for good makes of which is from 27s. 6d. to 29s. per ton f.o.b. in the Tyne.

Water-Works Insured against Air-Raids.—The Liverpool Water Committee have decided to insure against air-raids the whole of the works, both in Liverpool and at the various watersheds, for the sum of £3,500,000.

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Improved Working at Uxbridge.

Attention was called by a shareholder, at the annual meeting of the Uxbridge Gas Company, to the fact that, though there was less coal used last year, a larger quantity of gas was made than in the preceding twelve months. The Chairman (Mr. H. E. Jones) remarked that this was due to the new retort-house being brought into use; and it proved what good work their Manager (Mr. Charles Hulme) and his staff had done for them. The report adopted stated that there was a sum of £9242 available for division; and the Directors therefore recommended the payment of a dividend at the full statutory rate of 5⅞ per cent., less income-tax, for the year on the consolidated stock. This leaves a balance of £552 to be carried forward. At a subsequent special meeting, a resolution was unanimously passed approving of the Bill being promoted by the Company to bring about the acquisition of the Eton Gas Company.

Unusual Experience for Merthyr.—For the first time for many years, a reduction is shown in the consumption of gas at Merthyr Tydfil. At the annual meeting of the Company, the Chairman (Mr. Henry F. W. Harries) said this was due to early closing and the mild weather; and a further decrease might be expected during the current year, owing to the reduced public lighting. Dividends were declared at the rate of 5 per cent. per annum on the preference and ordinary stocks of the Company, both less income-tax.

Confidence at Wellington (Salop).—Though the sale of gas over the past year showed a decrease of 3 per cent., as compared with the preceding twelve months, the Directors of the Wellington (Salop) Gas Company share the confidence of the gas industry generally that a return to normal circumstances will bring about again the steady progress to which they have become accustomed. Nearly one-half the falling-off was accounted for by the reduction in the quantity used by the Council for water pumping. A dividend, making a payment for the year of 5⅝ per cent., less income-tax, was declared at the annual meeting. The quantity of gas actually sold per ton of coal carbonized last year was 11,943 cubic feet.

Coke-Fired Lorries.—Referring to the growing popularity of the coke-fired steam motor-lorry, the "Municipal Journal" remarks that in the provinces the Manchester Corporation are the pioneer municipal authority in regard to the use of this type of vehicle. Some time since the Gas Committee purchased one; and the acquisition of another 3-ton coke-fired steam-lorry chassis from the National Steam Car Company, Limited, has now been decided upon. As to London, it is pointed out that vehicles of this type have been purchased by the South Metropolitan, Wandsworth, Tottenham, South Suburban, and Croydon Gas Companies. Ordinary gas coke is used, graded to pass a 2-inch mesh and not to pass a ¼-inch mesh; and, power for power, coke fuel is claimed to be only about one-sixth of the cost of petrol at the present time.

Colne Valley Water Company.

The half-yearly meeting of the Company was held last Tuesday, when the Directors reported that the capital expenditure during the half year ended Dec. 31 was £6326, which included the final payments to contractors for the new beam-engine and buildings at Eastbury pumping-station, the laying of the new 8-inch main to Boreham Wood and Shenley, and several extensions of mains for affording new supplies to consumers. Supplies have been provided for the erection of 115 buildings; while 271 new supplies have been added to the Company's books. Owing to the war, the contract for the second beam-engine at Eastbury has been unavoidably delayed; and it is unlikely that the engine will be available during the present year. The Directors regret to announce that, owing to failing health and advanced years, it has been found necessary to relieve from active service Mr. John Blackburn, who has been the Company's Resident Engineer for forty years. A pension has been granted him in consideration of the valuable services he has, throughout his career, rendered to the Company. The profit in respect of the revenue account amounted to £18,491. The balance of the dividend and interest account, after paying the interest on debenture and preference stocks, and transferring £2000 to the contingency fund, was £27,835. Out of this, the Directors recommend the payment of the full statutory dividends at the rate of 10 and 7 per cent. per annum on the several classes of ordinary stock, and in addition a payment of 1 per cent. (actual) on account of back-dividends on the "A," "B," and "C" stocks—leaving £14,906 to be carried forward.

Folkestone Gas Bill.—At a special meeting, the Sandgate Urban District Council have unanimously passed a resolution approving of opposition to the Folkestone Gas Bill. Remarks made, however, appear to justify the hope that an agreement with the Company may be come to on outstanding points before the Committee stage of the Bill is reached.

Wandsworth, Wimbledon, and Epsom District Gas Company.—The half-yearly meeting will take place next Tuesday, at the Westminster Palace Hotel, when the Directors will submit a report stating that the revenue account for the six months ended Dec. 31 shows a profit of £38,865. After providing for the interest on debenture bonds and stock, and on deposits and loans, there remains to the credit of the profit and loss (net revenue) account an amount of £32,097 available for payment of dividends. The Directors, therefore, recommend that dividends be declared at statutory rates as follows: On the Wandsworth "A" stock, £7 17s. 6d.; on the Wandsworth "B" stock, £6 7s. 6d.; on the Wandsworth "C" stock, £5 10s. 3d.; on the Wimbledon stock, £5 15s.; on the Epsom stock, £6 7s. 6d.; and on the new ordinary stock, £5 10s. 3d. per cent. per annum. The sale of gas in the half year showed a small increase of 0·5 per cent. over the corresponding period of 1914. The increase in the number of consumers was 738, and in stoves at rental 2514.

Richmond's Bungalow Cookers

SUPPLIED in four sizes, Richmond's "Bungalow" Cookers contain many special features of great practical utility. The Oven raised to prevent stooping; the hygienic advantage of the raised stand avoiding collection of dirt beneath cooker; the convenient hotplate with patent griller of increased efficiency, and the rack (Patent No. 4975/1914) holding plates in vertical position, are all features which strongly appeal. Right hand illustration shows the new size 'Bungalow' No. 3.

The RICHMOND
Gas Stove & Meter Co., Ld.
London & Warrington.

Hebden Bridge Board and Insurance.—At the monthly meeting last Thursday of the Hebden Bridge and Mytholmroyd Gas Board, the question of insuring the Board's property against damage by enemy air-craft was introduced. After discussion, the Clerk was empowered to get quotations with the object of insuring the property.

Lostwithiel Gas Company.—Mr. J. H. Jeffery (the Chairman) presided at the annual meeting of the Company last Wednesday. The Directors reported that during the first half of the year, when troops were billeted in the town, the consumption of gas was a record in the history of the undertaking; but since May less gas had been used than in former years. The price was advanced in June. The supply of coal and materials for the ensuing year was causing much anxiety. Dividends of 6s. 3d. on the "A" shares and 1s. 3d. on the "B" shares were declared.

Extension of Devonport Gas Plant.—The Plymouth Town Council yesterday week adopted a report of the Gas Committee recommending that the Consulting Engineer of the Devonport Gas-Works (Mr. Isaac Carr) be instructed to invite tenders for an extension of the water-gas plant, and also for new saturators for the sulphate plant. The erection of new oil-tanks at the works has been commenced. The report of the Gas Engineer (Mr. W. P. Tervet) showed that the output of gas during December last was 8·08 per cent. in excess of the corresponding month of 1914.

Croydon Gas Company.—The report to be submitted at the half-yearly meeting next Friday states that the sales of gas for the six months ended Dec. 31 exceeded those of the corresponding period of 1914 by 2·19 per cent. The number of consumers increased in the half year by 613; that of stoves on hire is greater by 663 cookers and 2535 fires, while 84 and 349 respectively have been sold to consumers, representing a total increase in gas-stoves of 3631. After providing for all fixed charges, there remains available for division a balance of £34,773; and the Directors recommend that dividends be declared for the half year at the rates per annum (less income-tax) of 14½ per cent. on the "A" stock, 11½ per cent. on the "B" and "C" stocks, 5 per cent. on the "D" stock, and 10 per cent. on the "E" stock. The dividends will absorb £24,103, leaving £10,670 to be carried to next account.

Bangor (co. Down) Gas Supply.—Mr. P. C. Cowan, the Chief Engineering Inspector of the Irish Local Government Board, has held an inquiry into the Bangor Urban Council's application for a Provisional Order for the taking over of land and property to enable an extension of the gas-works premises to be made. Mr. Barker Mitchell, the Gas Manager, said there was a great necessity for more storage if an uninterrupted supply of gas was to be maintained. Mr. Cowan favoured friendly negotiation between the parties concerned, so as to obviate the issuing of an official order. The Urban Council agreed to an increase in the salary of Mr. W. Scotland, the Assistant Gas Manager from £84 to £104 per annum; granted a bonus of £50 to Mr. H. C. Bell, the Town Surveyor, for the preparation of plans in connection with the proposed Provisional Order; and agreed to a bonus of £50 to the Gas Manager.

West Cheshire Water Company.—The Directors' report for the year ended Dec. 31 stated that the balance at credit of profit and loss account amounted to £7490, which, with £14,750 brought forward from the previous year, made a total of £22,240. Of this, interim dividends at the rate of 5 per cent. per annum, paid in August, absorbed £3000, leaving a balance of £19,240 available. The Directors recommended the payment of another dividend at the rate of 5 per cent. per annum on all classes of shares, absorbing £3000, and leaving a balance of £16,240 to be carried forward to the next account.

West Surrey Water Company.—At the half-yearly meeting of the Company last Tuesday—Mr. A. Telford Simpson presiding—a maximum dividend at the rate of 7 per cent. per annum was declared upon the ordinary £10 shares issued under the Acts of 1877, 1888, and 1901, and a maximum dividend at the rate of 10 per cent. per annum upon the ordinary £10 shares issued under the Act of 1869. The report showed that the income for the six months ended Dec. 31, after making provision for empty houses, irrecoverable rates, &c., amounted to £9546, and the expenditure to £4445. The additional supplies connected during the half year represent an increased future rental of £241 per annum.

Yeadon Water Bill.—The Yeadon Water Company's gathering grounds at Hawksworth are near to those of the Baildon Council; and, as it was considered that certain provisions of the Company's Bill affected the interests of the Council, a special meeting was recently held, and it was decided by 7 votes to 3 to oppose the Bill. According to a memorandum to the minutes submitted to the Council last Tuesday, it appears that, on the day following the special meeting, the Chairman delivered to the Clerk a notice in writing withdrawing the vote given by him in favour of taking action, thus reducing the number of votes to 6 against 3, which is not a sufficient majority to make such a resolution operative. The minutes were passed; it being understood that the action of the Chairman had prevented the intended opposition to the Bill.

Birmingham Air-Raid Precautions.—In the course of a statement furnished to the Press by the Lord Mayor of Birmingham (Alderman Neville Chamberlain), on the subject of precautions against air-raids, the public are informed that the extent and degree of public lighting in the city is at the discretion of the Chief Constable; and the Watch Committee have indicated to him that in their opinion one light at each street corner or dangerous spot is sufficient, and that all other public lights should be discontinued until further notice. They have further indicated to the Chief Constable that they think there should be more uniformity in the lighting of shops, and that observance of the Home Secretary's order should be strictly enforced. When public warning is given of an anticipated air-raid, all street-lamps will be extinguished; and the lights in any shops or houses should be at once put out. Lamps on trams and omnibuses and all public and private conveyances must also be extinguished. Factories, too, should at once stop work, and extinguish all lights.

Economy

The necessity that is upon all of us to practise rigid economy furnishes a potent argument for the adoption of DAVIS Cookers for the coming season's trade.

Davis Cookers stand for—

1.—Economy in maintenance work and charges—a matter of great and growing importance to every Gas Undertaking.

2.—Economy in gas consumption—a no less vital consideration to gas-cooking consumers.

Orders from stock executed in due rotation.

THE DAVIS GAS STOVE CO., LTD.,
The Gas Exhibition Salons,
60, OXFORD STREET, LONDON, W.

No Advances in Salaries at Darlington.—The Darlington Gas Committee last Friday rejected applications from the Assistant Engineer for an advance of salary, and for the fixing of a maximum salary to be reached by annual increments; and from the Works Chemist, for an advance. The Committee announced that they would not consider questions of increases during the continuance of the war.

Hull Water Supply.—The Hull Corporation Water and Gas Committee have declined to sanction a recommendation made by the Water Engineer (Mr. C. B. Newton) to abolish outside all water-taps [see *ante*, p. 274]. The Engineer was of the opinion that, in order to conserve the water supply and reduce waste, no further increase in the number of outside taps should be allowed, and that, as existing taps of this character became worn out, they should not be renewed except in the cases where they formed the sole supply to houses. Alderman T. S. Hill observed that the Engineer had made the initial mistake of attempting to put this policy into operation without consulting the Committee, which had created a great amount of feeling. The Chairman (Mr. P. Gaskell) said that there were far-reaching matters which would develop out of the Engineer's report. Mr. T. B. Atkinson remarked there were hundreds of houses in Hull where it was of the greatest importance that the outside gullies should be flushed. The Committee have resolved to make a grant of £15,000 out of profits to the relief of the rates. According to a statement prepared by the City Accountant, the net surplus for the past year was £14,550; but there was an estimated saving of £2000 on renewals and additions.

Salisbury Gas Company.—At the half-yearly meeting of the Company, the Chairman (Mr. George Fullford), moving the adoption of the accounts and the payment of the full dividends, said he was the more pleased to do so because the abnormal situation caused by the war had resulted in the cost of coal, labour, and all other materials used in the manufacture and supply of gas being largely increased, and there appeared to be no immediate prospect of any relief, and in other ways many difficult questions had arisen that called for their serious consideration. The supply of coals had improved; but materials, from a variety of causes, were often delayed. Consequently much larger stocks than usual had to be kept as a measure of precaution. Against all this they only had 3d. more per 1000 cubic feet of gas from private consumers, and no increase from public lighting. Owing to the Lighting Order, the revenue from the latter had fallen off by some £400. There had been a very good increase in the consumption of gas for private lighting, heating, and cooking. Tar prices were low at present. Their tar went to the distilleries for the extraction of the light oils for the manufacture of high explosives. Sulphate of ammonia sold better, and, with the scarcity of animal manure, if gardeners knew the value of this artificial manure, all their output ought to be used in the immediate district. They had now had their new Engineer and Manager (Mr. W. Fielden) with them for four months; and they were very well satisfied. He had good technical and practical knowledge, gained in large, well-ordered works; and the commercial side of his character would specially commend him to the consumers.

Spenborough Water Charges.—The price to be paid by the Spenborough Urban District Council for water supplied in bulk by the Bradford Corporation is the subject of arbitration proceedings taking place in London this week. The district has for some years obtained its water supply from Bradford; the price at present paid being 9d. per 1000 gallons.

Herne Bay Water Company.—A dividend at the rate of 5 per cent. per annum for the half year ended Dec. 31 upon the ordinary stock of the Company was declared at the meeting last Tuesday. In the report, it was remarked that, "having regard to the reduction of receipts for the past year, which is entirely due to the war, and the improbability of there being any substantial improvement in the current year, the Directors are of opinion that it would be prudent to reduce the dividend on the ordinary stock to 5 per cent. per annum. But they have no reason to doubt that on the return to normal conditions the net revenue will be sufficient for payment of dividends as before." The income for the past six months, after making provision for empty houses, irrecoverable rates, &c., amounted to £2850, and the expenditure to £1480.

A proposal by the Water Committee of the Plymouth Corporation to purchase the watershed and certain lands below the Burrator reservoir was approved by the Town Council yesterday week. The total area to be acquired is 4891 acres; and the Corporation are to pay a perpetual chief rent of £825 per annum, and to have the right of redeeming this at any time for £22,000. A sum of £125 per annum for seven years is to be allowed by Sir Henry Lopes, the seller of the land, in respect of certain apportioned rents. Alderman R. W. Winnicott (the Chairman of the Water Company) said the purchase of the land would enable the Corporation to guard against the possibility of contamination of the water. The scheme would be practically self-supporting.

NEWSPAPERS FOR NEUTRAL COUNTRIES.

The Secretary of the War Office has issued the following order:

> The public are informed that newspapers and other printed publications will not be sent to Neutral European Countries unless posted direct from the office of publishers or newsagents who have obtained permission from the War Office for this purpose. Persons desiring to send newspapers, &c., to Neutral European Countries should, therefore, give their orders for execution to publishers or newsagents who have obtained such permission.

The Publisher of the "JOURNAL" has obtained the required permission of the War Office; and he will, on receipt of instructions, forward copies direct from the office to any neutral country.

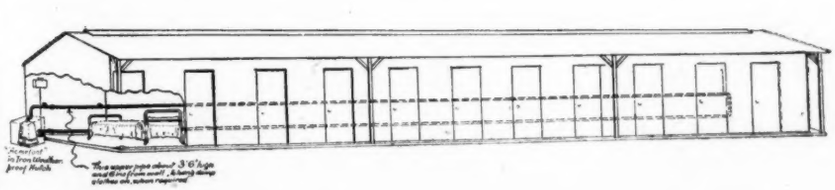
The "Acmefont" Gas-Heated Boiler.

The "Acmefont" is specially suitable for warming Cubicle Buildings used for Sleeping Accommodation, Sick Bays, Changing Clothes, &c. The heating of each hut is under separate control, and this system of heating possesses advantages in

WORKING,
FIRST COST, and
MAINTENANCE

which a centrally-fired system cannot offer.

EXPERT OPINION FREELY GIVEN BY WELL-KNOWN HEATING SPECIALISTS.



ARDEN HILL & CO.,
Acme Works,
BIRMINGHAM.

STOCK MARKET REPORT.

THE week just completed on the Stock Exchange was not quite up to the level of its predecessor in the point of quality. Not that there was much to complain of in regard to the number of recorded transactions, but they were largely in lines of inferior importance. The more dominant and influential markets were rather languid and devoid of interest, while at the same time exempt from any pronounced weakness. Among the gilt-edged division, War Loan was firm and Consols moderately so, and the demand for Colonial issues was maintained. Home Rails were no better than dull, though the annual reports were as good as was expected as a general rule. Americans were weak, for reasons international and domestic which are much in the public view. Canadian Pacific was momentarily depressed at the prospect of the new Excess Profits Duty, but upon reflection made a prompt recovery. Meanwhile, the increase in its profits is going on gaily. The Foreign Market was not strong, and the French loan eased perceptibly. Argentines were inclined to droop, owing to harvest prospects being less clear; and South Africans were quiet and dull. For buoyancy and animation one must again turn to the Miscellaneous group, where rubber, oil, and copper were in full swing. Among the interesting topics of the week, of chief importance was the question how best shall the sinews of war be raised. The Government attach much importance to the development and extension of the Dollar Mobilization Scheme. The response of the public, as sellers, has been satisfactory, it is believed, and the Government now are understood to be about to start the borrowing part of the scheme. The terms of agreement will require careful consideration, for the depositors could scarcely be asked to concede a free hand to the bailees to purchase loaned securities at some future date at prices now unknown. Upon the question of issuing Bonus Bonds, the Montagu Committee have not arrived at a recommendation. The French scheme for negotiating French-owned stocks here has not further materialized. Business in the Gas Market was, if possible, even quieter than ever. Excluding the premier Company, not a score of bargains could be compiled out of the whole list of quotations. But so far as there was material whereby to gauge the tendency, it was quite satisfactory. The Money Market was unchanged.

Bargains done for cash during the week were as follows: On Monday, Commercial 4 per cent. 75, Gas Light ordinary, 75, 76. On Tuesday, Bournemouth "B" 12, Buenos Ayres debenture 71, Gas Light ordinary 75, 75⅛, 75⅜, Imperial Continental 65. On Wednesday, Gas Light ordinary 75⅜, Primitiva preference 3⅜. On Thursday, Cape Town preference 4¼, 4⅜, Gas Light ordinary 75, 75⅛, 75¼, 75⅜, 75⅝, Primitiva 2, 2 1/32, South Metropolitan 75⅞, 76. On Friday, European 12⅛, Gas Light ordinary 75⅛, 75⅜, ditto maximum 60⅜, ditto debenture 61, 61¼. Imperial Continental 64½, 65, Primitiva 2 1/16, 2⅛, ditto preference 3 5/16, 3⅜, South Metropolitan 75¼, 76. Among unquoted undertakings, bargains were done in Sunderland at 193, and Swansea at 92½, 93.

The Bank rate is 5 per cent.—as fixed on Aug. 8, 1914.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex. Dividend.	Previous Div or Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices. July 30, 1914.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.				£ s. d.	
1,551,868	Stk.	April 8	2½	5⅛	Alliance & Dublin Ord.	59—64	8 18 2	..
874,000	,,	July 10	4	4	Do. 4 p.c. Deb.	76—79	5 1 8	..
280,000	5	April 29	7½	3/-	Bombay, Ltd.	5⅛—6⅜	6 17 8	..
60,030	10	Feb. 26	16	15/-	Bournemouth Gas and Water — 10 p.c.	29—30	6 6 8	..
393,110	10	,,	7	7/-	Bournemouth Gas and Water — B 7 p.c.	15—15½	4 10 4	11
115,000	10	,,	6	6/-	Bournemouth Gas and Water — Pref. 6 p.c.	13½—14	4 5 9	..
159,740	—	—	—	4	Bournemouth Gas and Water — 4 p.c. Deb.	..	—	..
932,045	Stk.	Feb. 26	†14	†6/-	Brentford Consolidated	261—266	5 5 3	..
734,900	,,	,,	†11	55/-	Do. New	204—209	5 5 3	..
55,000	,,	,,	5	5	Do. 5 p.c. Pref.	109—111	4 10 1	..
221,400	,,	June 11	4	4	Do. 4 p.c. Deb.	91—93	4 6 0	..
217,380	Stk.	Feb. 26	11	10⅔	Brighton & Hove Orig.	208—213	5 3 4	..
244,200	,,	,,	8	7⅔	Do. A Ord. Stk.	154—159	5 0 8	..
630,000	20	Mar. 26	12½	22/6	British	44—45	5 11 1	..
120,000	Stk.	June 26	4	4	Do. 4 p.c. Deb. Stk.	88—90	4 8 11	..
245,771	Stk.	June 26	4	4	Buenos Ayres 4 p.c. Deb.	85—87	4 12 0	71
100,000	10	—	—	—	Cape Town & Dis., Ltd.	1⅛—2⅛	—	..
100,000	10	—	—	4/6	Do. 4½ p.c. Pref.	4—6	—	4⅜—4⅞
100,000	Stk.	June 26	4½	4½	Do. 4½ p.c. Deb. Stk.	70—75	6 0 0	..
157,150	Stk.	Feb. 26	5	5	Chester 5 p.c. Ord.	108—110	4 10 11	..
1,513,380	Stk.	Feb. 12	5/9/4	49/4	Commercial 4 p.c. Stk.	106—108	5 1 2	75
660,000	,,	,,	5½	46/8	Do. 3½ p.c. do.	103—105	5 1 6	..
475,000	,,	June 11	3	3	Do. 3 p.c. Deb. Stk.	69½—71½	4 3 11	..
800 000	Stk.	,,	4	4	Continental Un'on, Ltd.	76—79	5 1 3	..
300 000	,,	,,	7	7	Do. 7 p.c. Pref.	115—118	5 18 8	..
278,400	—	—	—	11½	Croydon B and C 7 p.c.	..	—	..
492,270	Stk.	,,	6	6	Derby Con. Stk.	123—125	4 16 0	..
55,000	,,	—	4	4	Do. Deb. Stk.	102—104	3 16 11	..
1,002,180	10	July 29	10	10/-	European, Ltd.	17½—18	5 11 1	12½
16,3 7,185	Stk.	Feb. 10	4/17/4	42/-	Gas Light and Coke — 4 p.c. Ord.	98—102	4 15 6	75—76*
2,600,000	,,	,,	3½	3½	Gas Light and Coke — 3½ p.c. max.	76—79	4 8 7	60¼*
4,062,235	,,	,,	4	4	Gas Light and Coke — 4 p.c. Con. Pref.	96—99	4 0 10	..
4,674,850	,,	June 11	3	3	Gas Light and Coke — 3 p.c. Con. Deb.	72½—74½	4 0 6	61—61½
130,000	,,	,,	10	10	Gas Light and Coke — 10 p.c. Bonds	..	—	..
258,740	Stk.	Mar. 12	5	4½	Hastings & St. L. 3½ p.c.	87—89	5 12 4	..
70,000	10	April 29	11	6	Hongkong & China, Ltd.	16½—16⅞	6 11 4	..
86,600	—	—	—	9½	Hornsey 7 p.c.	..	—	..
131,000	Stk.	Mar. 12	7⅛	7⅛	Ilford A and C	151—154	5 2 4	..
65,780	,,	,,	6⅛	6½	Do. B	115—118	5 8 0	..
55,500	,,	June 26	4	4	Do. 4 p.c. Deb.	92—94	4 5 1	..
4,940,000	Stk.	May 14	9	4½	Imperial Continental	150—160	5 12 6	64½—65
1,235,000	Stk.	Feb. 12	3½	3½	Do. 3½ p.c. Deb. Red.	84—86	4 1 5	..
200,242	Stk.	Mar. 12	6½	6½	Lea Bridge Ord. 5 p.c.	119—121	5 7 6	..
2,498,905	Stk.	Feb. 26	10	10	Liverpool 5 p.c. Ord. — A	211—213	4 13 11	..
					Liverpool 5 p.c. Ord. — B	146—148	4 14 7	..
306,083	,,	June 26	4	4	Do. 4 p.c. Pr. Deb. Stk.	..	—	..
75,000	5	June 11	6	2/-	Malta & Mediterranean	4⅛—4⅝	6 9 9	..
250,000	100	April 1	4½	4½	Met. of Melbourne — 4½ p.c. Deb.	99—101	4 9 1	..
541,920	20	May 28	4	6/-	Monte Video, Ltd.	11½—12	6 18 4	..
1,375,892	Stk.	July 29	4½	4½	Newc'tle&G'tesh'd Con.	98½—99½	4 10 6	..
529,705	Stk.	June 26	3⅜	3⅜	Do. 3½ p.c. Deb.	82—83	4 4 10	..
55,940	10	Feb. 26	7/14/0	7/8⅝	North Middlesex 7 p.c.	14—15	5 2 8	..
800,000	Stk.	May 14	8	8	Oriental, Ltd.	117—122	6 11 2	..
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7⅛—7⅞	6 9 0	..
60,000	50	Feb. 26	13	65/-	Portsea, Island B	128—131	4 19 8	..
100,000	50	,,	13	60/-	Do. C	118—121	4 19 2	..
52,000	50	,,	10	—	Do. D	..	—	..
249,980	5	April 29	8	—	Primitiva Ord.	5⅛—6	6 13 4	2—2 1/32
499,960	5	June 26	5	2/6	,, 5 p.c. Pref.	4⅞—5	5 0 0	3 1/16—3⅛
521,600	100	June 2	4	4	,, 4 p.c. Deb.	91—93	4 6 0	..
—	—	—	—	4	,, ,, ,, 1911	..	—	..
346,198	Stk.	June 26	4	4	River Plate 4 p.c. Deb.	85—87	4 12 0	..
150,000	10	May 14	6	6/-	San Paulo — 6 p.c. Pref.	10⅛—11	5 9 1	..
125,000	50	July 1	5	5	San Paulo — 5 p.c. Deb.	47—49	5 2 0	..
135,000	Stk.	Mar. 12	10	10	Sheffield A	223—224	4 9 3	..
209,984	,,	,,	10	10	Do. B	222—224	4 9 3	..
523,500	,,	,,	10	10	Do. C	220—222	4 10 1	..
90,000	10	May 28	9	6/-	South African	10⅛—11⅛	7 16 6	..
6,609,895	Stk.	Feb. 10	5/4,0	44/-	South Met., 4 p.c. Ord.	111—113	4 16 8	75⅛—76*
1,895,445	,,	July 10	3	3	Do. 3 p.c. Deb.	73⅛—74⅛	4 0 6	..
224,820	Stk.	Feb. 26	8½	8½	South Shields Con. Stk.	157—159	5 6 11	..
952,795	Stk.	Feb. 26	6	48/4	S'th Suburb'n Ord. 5 p.c.	114—116	5 3 5	..
60,000	,,	,,	5	5	Do. 5 p.c. Pref.	110—112	4 9 3	..
135,000	—	—	—	48/4	Do. West Kent.	..	—	..
187,558	,,	June 26	5	5	Do. 5 p.c. Deb. Stk.	116—118	4 4 9	..
629,740	Stk.	May 14	5	5	Southampton Ord.	99—102	4 18 0	..
120,000	Stk.	Feb. 12	7½	7½	Tottenham District — A 5 p.c.	135—138	5 8 8	..
782,275	,,	,,	6	6	Tottenham District — B 3½ p.c.	116—117	5 2 7	..
181,255	,,	June 26	4	4	Tottenham District — 4 p.c. Deb.	87—89	4 9 11	..
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	8 6 8	..
149,900	10	July 1	5	5	Do. 5 p.c. Deb. Red.	93—95	5 5 9	..
236,476	Stk.	Mar. 12	5	5	Tynemouth, 5 p.c. max.	108½—109½	4 11 4	..
					Wandsworth, Wimbledon, and Epsom—			
80,000	Stk.	Feb. 26	8⅜	78/9	Wandsworth A 5 p.c.	151—156	5 7 4	..
255,636	,,	,,	6⅝	63/9	,, B 3½ p.c.	129—134	5 3 7	..
108,075	,,	,,	5/17/8	55/1½	,, C 3½ p.c.	110—115	5 2 0	..
852,000	,,	,,	6½	57/6	Wimbledon 5 p.c.	117—122	5 0 5	..
98,000	,,	,,	6⅝	63/9	Epsom 5 p.c.	121—126	5 5 2	..
88,416	,,	June 26	3	3	3 p.c. Deb. Stk.	66—69	4 6 11	..

* Ex. Div. † Paid on Old 10 p.c. and 7 p.c. Standard Stocks.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

WORKS ENGINEER AND MANAGER. Cannock, &c., Gas Company. Applications by Feb. 28.
MANAGER (Small Works). No. 6158.
RENTAL CLERK AND COLLECTOR. Walton-on-Thames Gas Company.
CLERK AND COLLECTOR. Paignton Gas Company.
CLERK. No. 6156.
MAIN AND SERVICE LAYER. Abercarn Gas-Works.

Appointments Wanted.

LADY DEMONSTRATOR AND LECTURER. No. 6157.

Plant, &c. (Second Hand), for Sale.

DENMAR RUBBER BAGS. Dublin Gas Works.
SCRUBBER. No. 6154.

Meetings.

HORNSEY GAS COMPANY. No. 5, Great Winchester Street, E.C. March 10. 3.30 o'clock.

Sale of Stock.

ALDERSHOT GAS, &c., COMPANY. London Mart. March 14.

TENDERS FOR

Coal.

DARWEN GAS DEPARTMENT. Tenders by March 4.
EASTBOURNE GAS COMPANY. Tenders by Feb. 24.

Cookers.

PLYMOUTH CORPORATION. Tenders by Feb. 26.

Fire-Clay Goods.

LOUGHBOROUGH GAS DEPARTMENT.
RHONDDA GAS AND WATER DEPARTMENT. Tenders by March 1.
WOMBWELL GAS AND WATER DEPARTMENT. Tenders by March 3.

General Stores (Compo. Pipe, Lead, Cocks and Brass Goods, Paints, Sulphuric Acid, Lime, Ironmongery, &c.)

PLYMOUTH CORPORATION. Tenders by Feb. 26.
RHONDDA GAS AND WATER DEPARTMENT. Tenders by March 1.

Lighting Goods, &c.

PLYMOUTH CORPORATION. Tenders by Feb. 26.

Meters.

PLYMOUTH CORPORATION. Tenders by Feb. 26.
RHONDDA GAS AND WATER DEPARTMENT. Tenders by March 1.

Pipes.

PLYMOUTH CORPORATION. Tenders by Feb. 26.
RHONDDA GAS AND WATER DEPARTMENT. Tenders by March 1.

R. & J. DEMPSTER, LTD. 64 & 2396 Manchester.
THE "ROYAL" COKE BREEZE & COAL WASHER.
SOLE MAKERS OF THE "ROYAL" COKE BREEZE